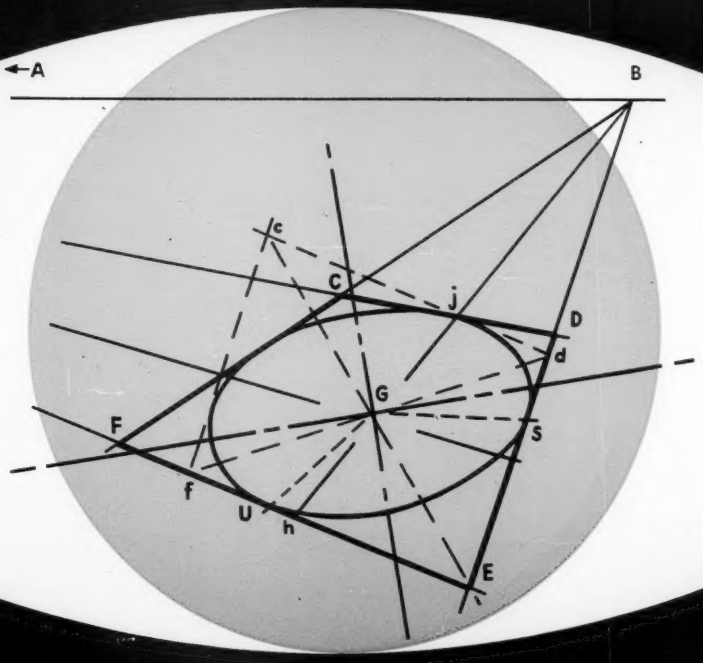
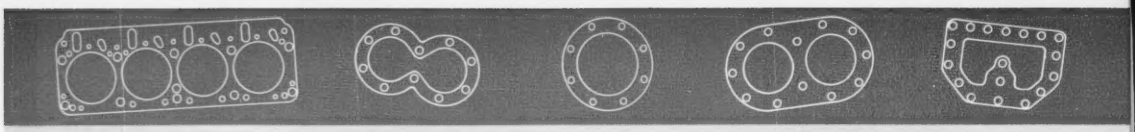
Design Engineering

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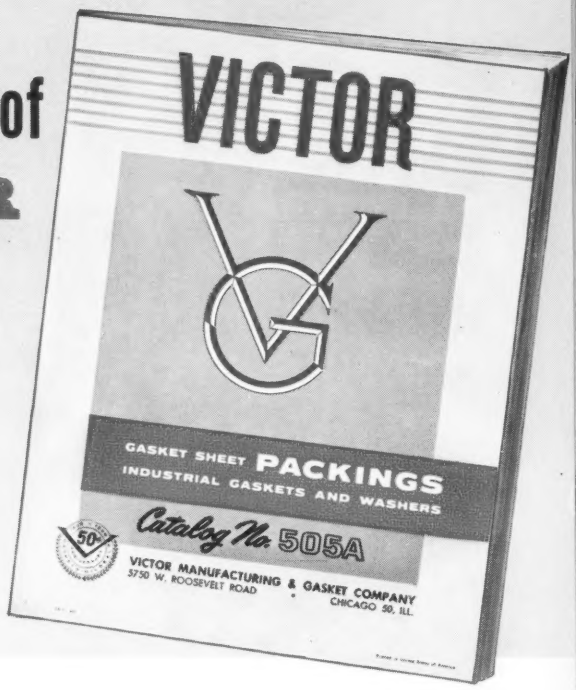
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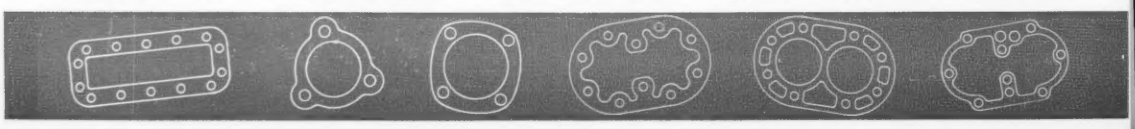
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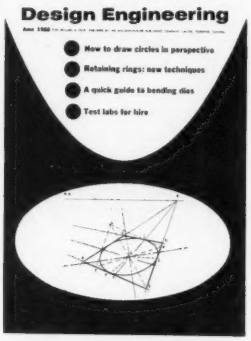
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This month's cover

We've had no end of guesses as to what this month's cover represents. Some who saw the draft design on our pin-up board thought it represented the inner workings of an egg — with yolk, heart and nerves all included. Actually, it's Gerry Berns' impression of the Sheppard article on circles in perspective which you will find on page 54.

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B. C. firm laminates giant beam 52
A prodigious engineering feat and it presented many problems. A story from the west coast describes how they were solved.

Geometrical construction of circles in perspective 54
Drawing circles in a square in projection is a knotty problem. Here's the exact formula, simply presented.

Want to hire a test laboratory? 56
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Only a small item at the Canadian National Business Show, but it embraces a vast store of engineering know-how and design.

Explosives aid metal-working industries 60
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—Or more correctly, their design ideas. The Ontario Science Fair teemed with youthful inspiration.

Universal bending dies simplified 65
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New concept in high-speed shutters 68
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Unique scrubber reduces cost of effluent treatment 70
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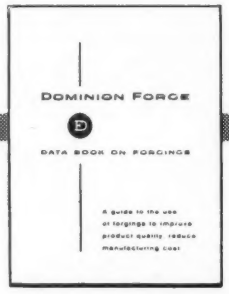
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Design Engineering

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The contributors

The man from Prague

There's very much of an international flavor about this month's biographical notes. Take Dr. Oswald Kolbert, who wrote the piece on the Technique of Designing with Retaining Rings. He was born, reared and educated in Czechoslovakia, from whence he fled in 1939. After a year in England he migrated to the United States, where he is now a citizen. An ardent skier, he hopes to visit Canada this year.

Dr. Kolbert graduated from the Prague Technical Institute in the 20s with BA and MA degrees in chemical engineering, then worked first as a research laboratory engineer and later as a market analyst. In 1933 he started his own business producing seamless steel tubing for bicycles, but the Nazis changed his plans. In England he worked on a farm in Surrey and about this job he says he was never healthier. In the States he joined Waldes Kohinoor Inc., of Long Island City, as a research and development engineer, and in 1946 became technical manager of the Truarc Retaining Rings Division. He lives in Long Island with his wife Martha, whom he married in Prague, and their daughters Marion, 20, and Katharine, 16.



Kolbert



Sheppard

The man from Budapest

Even more international is the story of our next author, but we won't tell it in any detail because Federico Strasser, author of Universal Bending Dies Simplified, is one of our most frequent contributors and his biography has appeared on this page several times. In brief, however, he was born in Budapest (Hungary), trained as an electrical engineer in Milan (Italy) and now partners a manufacturing business in electrical products in Santiago (Chile). Writing is his hobby and he recently authored a book on Practical Design of Sheet Metal Stampings.

The man from London

The travel theme continues with our next contributor, W. H. Sheppard, who writes the article on perspective ellipses. A graduate of London University (B.Sc. in electrical engineering), Bill has visited (usually by air), Spain, France, Holland, Iceland and various other places.

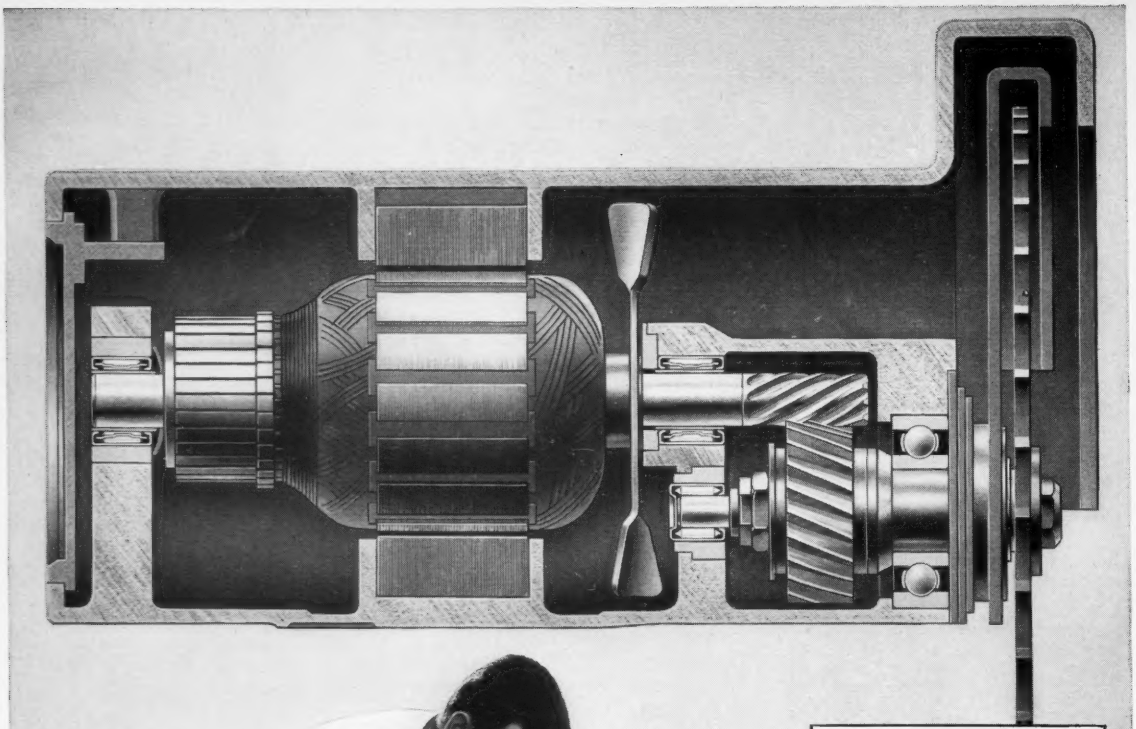
After graduating he spent seven years with the (British) Ministry of Aircraft Production on inspection assignments. Then came a seven-year stint teaching in technical institutions in Britain, after which he came to Canada and worked for Avro for nearly three years. Next came a year on the west coast with Boeing. He is now (by Bill's standards) reasonably settled, being on staff at McGill University in Montreal.

The man from Vancouver

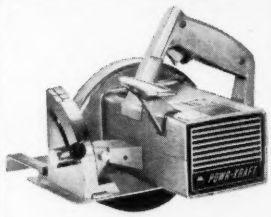
Art Joy, who authored West Coast Firms Laminates Giant Beam, is our B. C. editor. He has had over 20 years' experience in newspaper and business paper work in Vancouver and elsewhere on the coast. He has been at his present desk for three years and immediately before that was editor of Construction World.

Coming next month . . .

A feature issue on fluid power design . . . air versus oil . . . basic circuitry . . . basic components . . . pick of Canadian applications . . . standards

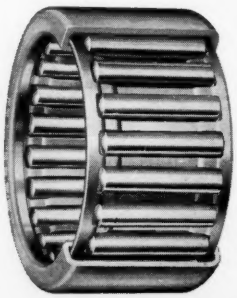






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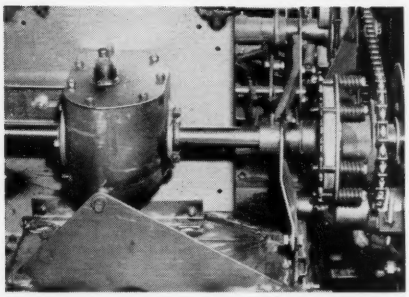
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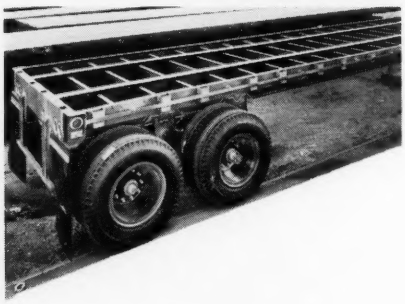
Reports — A world roundup of engineering and design interest

They came up with the answer to a driveshaft problem. .



You're designing a drive shaft for the feeder mechanism of a hay baler. To achieve the yield strength required for the shaft, would you use a 1¼-inch diameter heat treated alloy steel cold finished bar or a 1⅜-inch diameter carbon steel? At first sight the alloy steel might seem to be the solution because the smaller shaft would not require the use of three larger anti-friction bearings and a larger sleeve bearing. But engineers at the New Holland Machine Co., New Holland, Penna., came up with a better answer than either the expensive alloy steel or the larger shaft. They found they could get the required minimum yield strength of 120,000 pounds per square inch and yet retain the smaller shaft by using 1¼-inch heat-treated AISCI C-1144 cold drawn ground and polished steel bars. This resulted in a materials saving of 14% on the shaft.

New trailer design gives better load-to-weight ratio



By redesigning the frames of their flatbed trailers, the Fruehauf Trailer Co. achieved a substantial increase in the rated load capacity along with a reduction in weight. In the standard 35-foot flatbed, for instance, capacity was raised from 44,000 to 50,000 pounds and weight reduced from 10,200 to 9,190 pounds, a 26% increase in the load-to-weight ratio. One of the principal features of the new design is the use of six-inch lightweight structurals for the cross members. These beams pass through the webs of the two main longitudinal I-beams, which are now deeper than before. I-shaped openings for the cross beams provide for welded joints that add to strength and rigidity. Fruehauf engineers are working on designs to give still better load-to-weight ratios.

Cut cost of water filter by switching to plastics



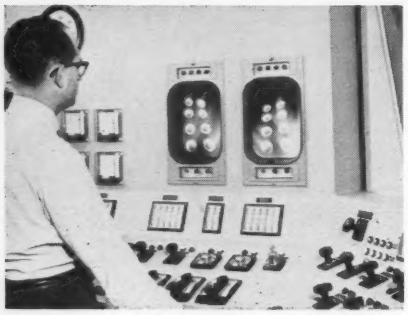
Switching from metal to plastic design has made possible the production of water filters for home use at one-third to one-half the normal cost. The sump body is a transparent acrylonitrile-styrene copolymer, the head a high-impact acrylic and the disposable filter cartridge is made with cellulose fibres. Only part of the cost improvement came from eliminating maching operations; another factor was partial redesign. By molding 4 in. diameter precision threads on both pieces (to seat an O-ring in the taper between the parts) it was possible to avoid compression gasketed construction and the tie rods and bolts necessary for industrial models in metal. The pipe connections at the acrylic (Implex) head are strong enough to sustain bending deformations of half an inch at the ends of 4 in. nipples threaded home in the plastic part.

Americans honor St. Lawrence achievement



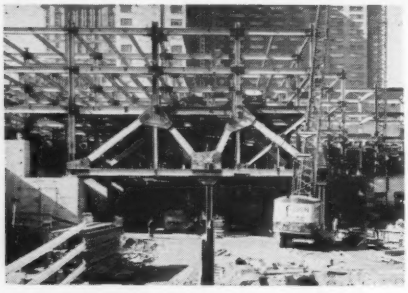
This picture shows three facets of the St. Lawrence project. It rates space here because the St. Lawrence project has been named by the American Society of Civil Engineers as the outstanding civil engineering achievement of the year. This is the first award to be made by the ASCE to honor an achievement in civil engineering, but henceforth awards will be made annually. The citation goes to all four entities involved in the project (the Hydro-Electric Power Commission of Ontario, the St. Lawrence Seaway Authority, the St. Lawrence Seaway Development Corporation (U. S.) and the Power Authority of the State of New York) and each received a plaque at ceremonies held at Massena, N.Y., on May 19. The St. Lawrence project scored in all three categories in which entries were judged: civil engineering skill, engineering progress and value to mankind.

Big Brother now keeps his eye on the plant's boilers



Here's another use for closed circuit television. In Los Angeles the Department of Water and Power uses it for firewatching — in other words, to monitor the huge fires inside the plant's boilers. The cameras provide a clear view of all 16 burners in each unit; they show if the burner lights correctly and reveal any plugged burner tips; when the boiler is under operation, cracks show up readily and can easily be located for servicing. Before installing industrial TV, the D. W. & P. examined various other devices for indicating boiler ignition, but none could keep track of all burners, nor would they show a flame failure. Also most temperature sensors tended to change only gradually as heat remains in the furnace even when the flames go out.

This was a nightmare for sidewalk supers



What would you do if seven railroad tracks ran through your basement? You might just move, but Dominion Bridge engineers had to find an alternate solution when they erected the steelwork for the new CNR office and garage building in Montreal. They solved the problem with an intricate network of heavy beams and trusses characteristic of bridgework rather than of building construction. However, the office structure above the trusses is of conventional building design with uniform spacing of columns and beams on all floors. It was all a rational solution to an unusual engineering problem in structural steel framing, but for a while during the early stages of construction the building must have looked like an architect's nightmare to sidewalk superintendents.

The fire destroyed everything except this tank



Fire broke out in a Montreal paint shop recently. The flames licked everything in sight, including a tank truck. The truck's tires caught fire and even its paintwork blistered off, but the tank itself survived. When it grew so hot that the pressure built up to 250 lb. per square inch, a valve equalized the pressure by the controlled release of highly volatile gas. Photographers on the scene took pictures of the tank releasing flames 125 feet into the air. The truck was so severely damaged that it could not be used again, but the tank, which had been fabricated only days before the fire, withstood the thermal shock. After being fitted with a new undercarriage it was back on the road within a few days.



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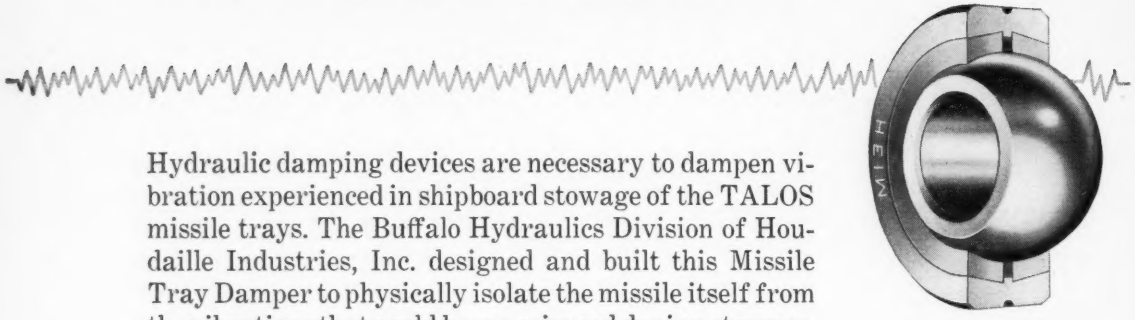
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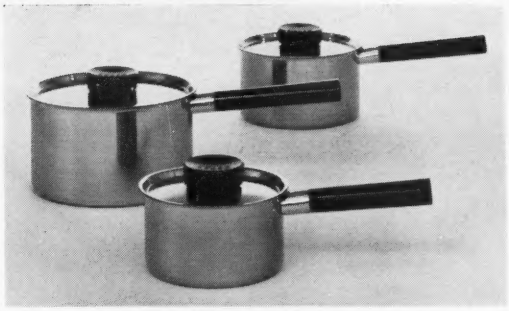
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Furnishings lose out in U. K. design awards



HRH the Duke of Edinburgh visited the Design Center in London, England, on May 19 and presented certificates to the manufacturers whose products gained the Design Awards. This year the awards winners ranged from casseroles to lighting columns; this contrasts with previous years, when most awards went to the furnishings industries. The awards are made on the basis of outstanding originality, workmanship, economy or some other quality which makes a real contribution to the industry. The award winners will be featured in a future Designews in Pictures in this publication.

New ore milling plant is highly automated

A new, highly automated ore milling plant has been opened by International Nickel Company of Canada in the Sudbury area. The modern mill, costing $12,000,000 makes extensive use of instrumentation to permit centralized, and in some cases completely automatic, control of the crushing, grinding, floating and dewatering processes. The use of radioactive isotopes has also been incorporated into the routine operations.

What was said

"New British industrial training methods are ten years ahead of those of the United States . . . this accounts for the U. K.'s record productivity and export increase." —Alan Beaton, director of Personnel Administration.

"Twenty-five percent of Canada's gross national product is derived from foreign trade, and goods made in Canada are not good exports if they do not fit the standards and meet the requirements of the country to which they are sent."—R. S. Eadie, President of Canadian Standards Association.

"When he decided to become an engineer, he (the European engineer) saw himself as a design engineer who could design and build machinery—not as a sales engineer or an engineering administrator . . . Invariably you will find them working on a drawing board."—H. Walter, Director of Research, Worthington Corporation.

Major Hydro contract

Ontario Hydro has announced the award of a contract valued at approximately $8.8 million to Associated Electrical Industries of Canada Limited. This will provide two 300,000 kilowatt steam turbo-generators for the new Lakeview generating station west of Toronto.

Big cash awards for stainless steel designs

The National Industrial Design Council is sponsoring a display designed to show the versatility of stainless steel. Scheduled to open at Ottawa's Design Center this September and to tour several other Canadian cities later, this show is a prelude to a stainless steel design contest in 1961. The 1961 competition will be restricted to designers working in Canada, and the winners will receive substantial cash awards. The award committee is backed by Atlas Steels Ltd., International Nickel Co. of Canada, and Union Carbide Canada Ltd. Entrants for this year's exhibit should write to Dr. E. R. Arthur, 119 Yorkville Ave., Toronto.

Ottawa report

Don Peacock, Ottawa editor

The electrical heating industry was given a healthy shot in the arm by exemption from the 11-percent sales tax, in Finance Minister Fleming's new budget.

Gross national product in 1959 was more than six percent above that for 1958.

Investment in machinery and equipment, which includes outlays both for the equipment of new plants and the modernization of existing plants, rose more than 9 percent in 1959 to a level of $2,626 million.

The Canadian Construction Association, in a brief to the federal government on unemployment, referred to the desirability of expanding apprenticeship and vocational training in Canada. They also pointed out the need for re-training many so that they can move out of the depressed areas of employment into trades which are more active.

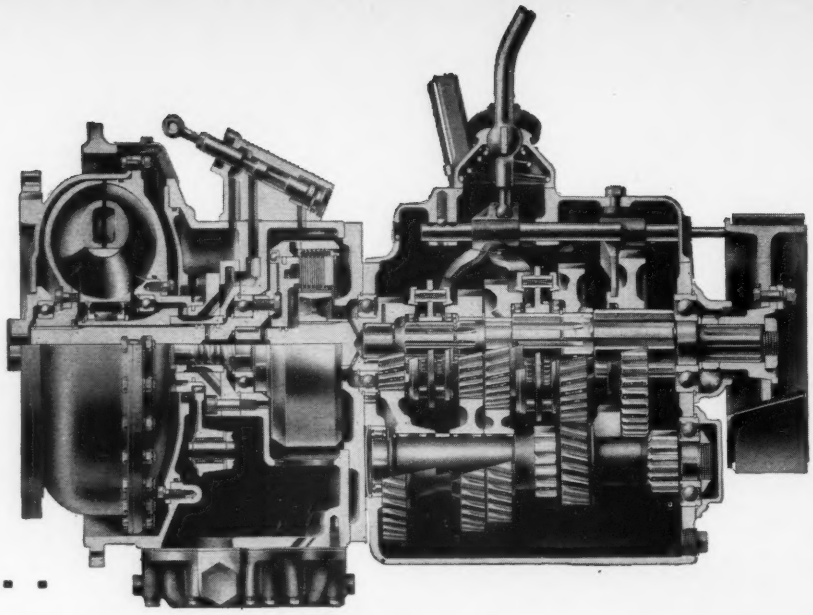
The publicly owned CNR plans to spend a total of $40 million on new signal and centralized traffic control equipment in the next five years.

The Royal Commission on Patents makes clear that one of its main reasons for its recommendation that complete specifications of any patentable invention be published within one year after application is filed is to encourage earlier use and improvement of new inventions.

The National Research Council has granted 486 scholarships for the 1960-61 study year worth a total of $1,040,000.

Conservative MP Broome of Vancouver is not very happy with the deal made by RCA Victor, on behalf of the publicly owned CNT, when they awarded contracts to a Norwegian firm worth over $1 million. It seems that a competing Vancouver firm bid $100,000 below the price that was accepted. The Vancouver design must have been OK, because they were paid $20,000 for it.

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INTERPON* GOES TO ENGLAND FOR TCA VANGUARDS

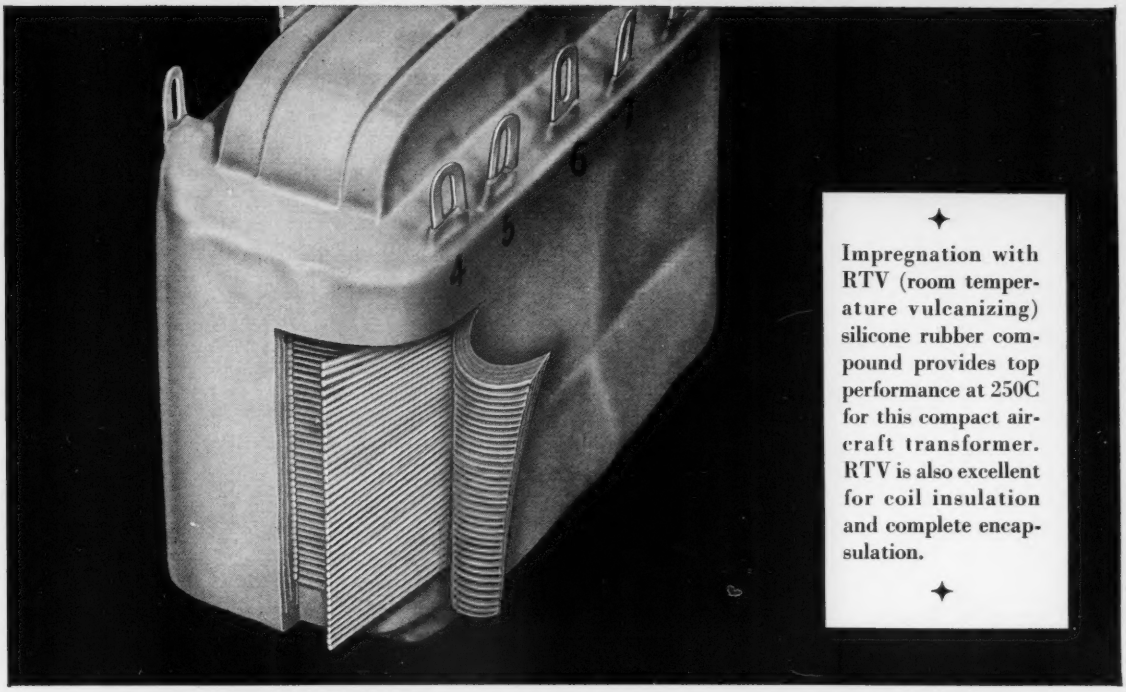
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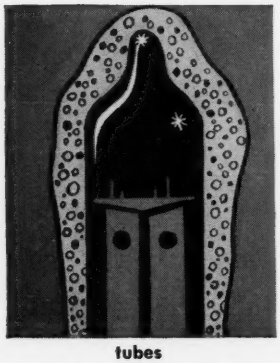


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Impregnation with RTV (room temperature vulcanizing) silicone rubber compound provides top performance at 250C for this compact aircraft transformer. RTV is also excellent for coil insulation and complete encapsulation.

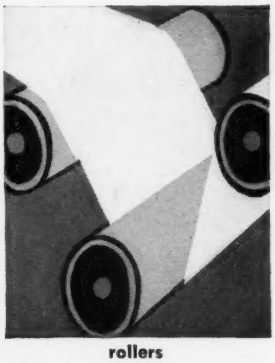
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RTV SILICONE RUBBER COMPOUNDS CURE WITHOUT HEAT... ARE SOLVENT FREE...EASY TO APPLY



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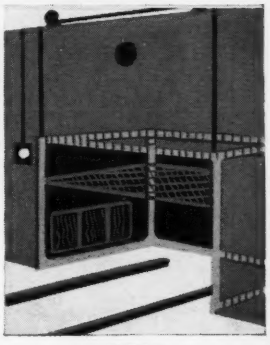
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Provides fast release—prevents sticking



concrete

Serves as resilient expansion joint compound



ovens

Seals-in heat (up to 450°F)

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TYPE	RTV-11	RTV-20	RTV-40	RTV-60	RTV-90	RTV-88	RTV-120 SPONGE	RTV-160 SPONGE
Viscosity, Poises	120	300	450	550	12,000	Thixotropic	Low viscosity	Medium viscosity

For further information on RTV Silicone Rubber Compound, contact Chemical Material Sales, 940 Lansdowne Ave., Toronto 4, Ont.

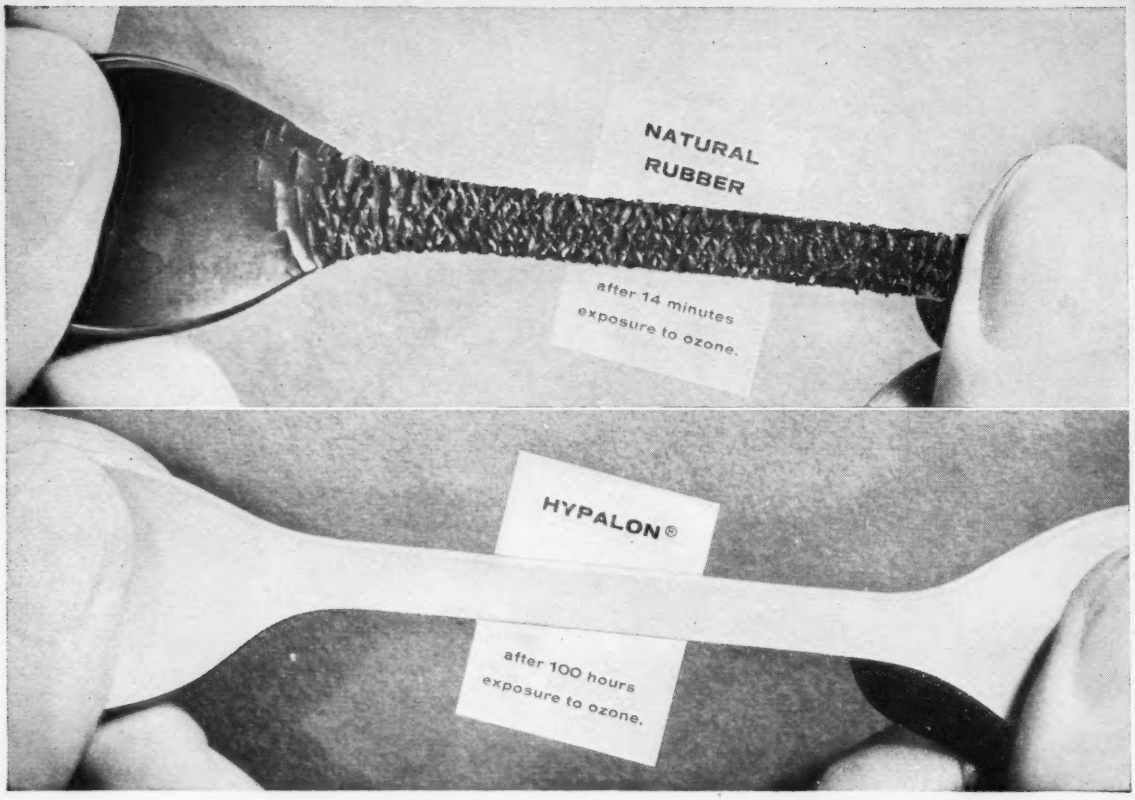
GENERAL ELECTRIC
RTV SILICONE RUBBER

457W-260

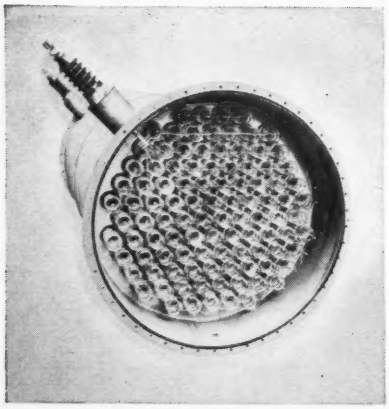
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This ozone generator is equipped with a head gasket made of "Hypalon". While ordinary rubber gaskets would crumble in seconds, gaskets of "Hypalon" have been standard equipment since 1953. None has failed from ozone attack.

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"Hypalon" never cracks or fails in ozone . . . resists ozone concentrations as high as 6% for extended periods of time. As a case in point, ozone generator head-gaskets made of "Hypalon" are still in service after more than five years.

For more information about ozone-proof "Hypalon", and your regular copy of "Elastomers Notebook", write to:—
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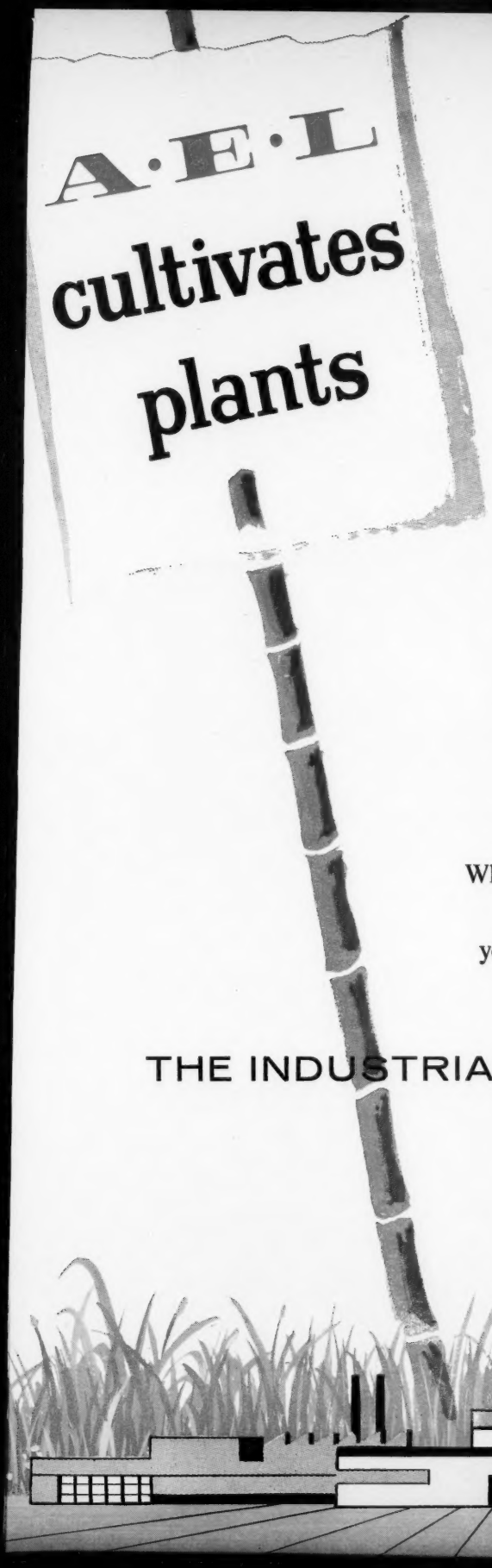
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where it matters most!

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**Studies have shown that the cost of applying a fastener is more than four times the cost of the fastener itself.*



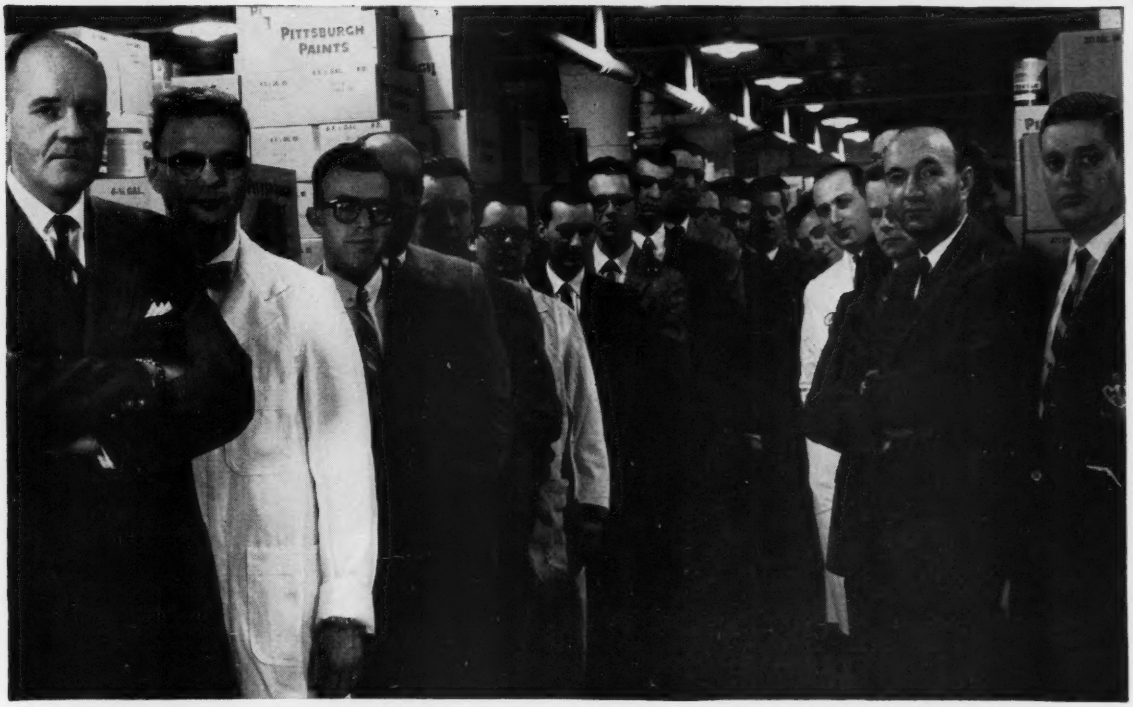
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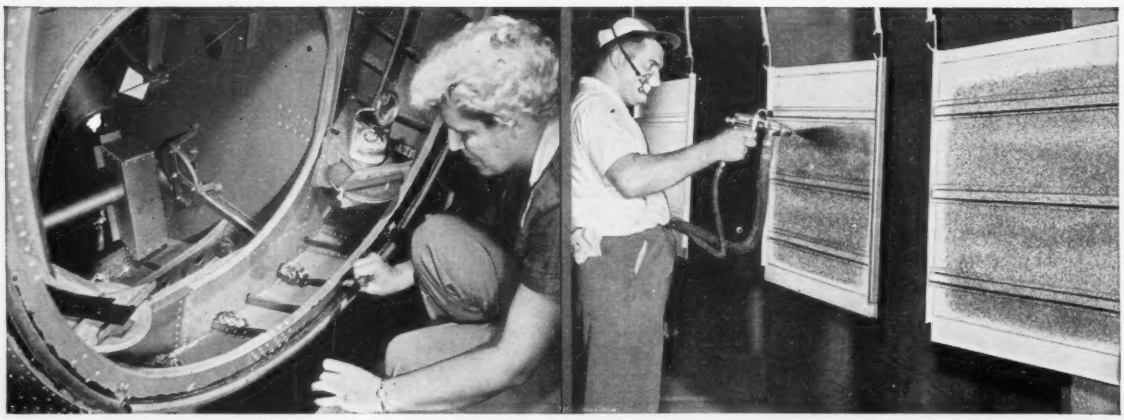
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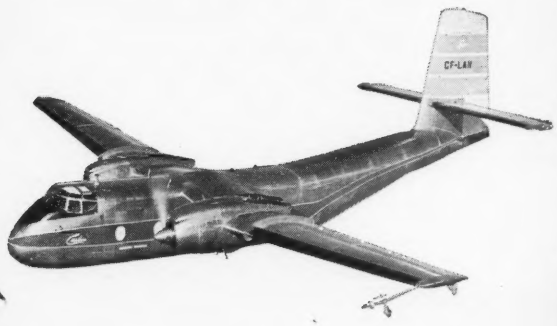
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case history of the month

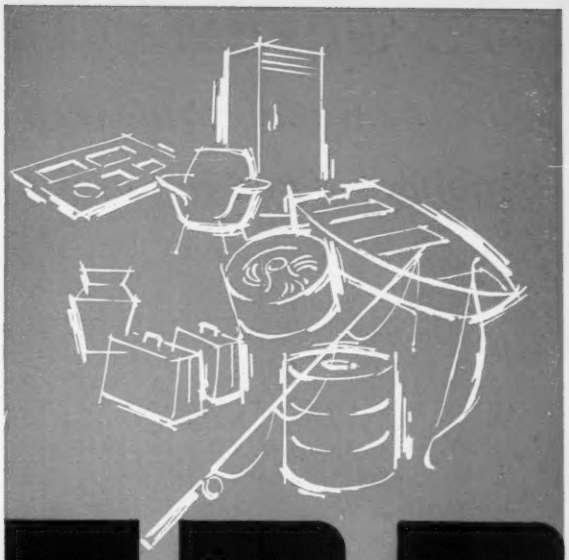


OVER 500 FIBERGLAS REINFORCED PLASTIC *parts in the versatile new* DE HAVILLAND DHC-4 CARIBOU

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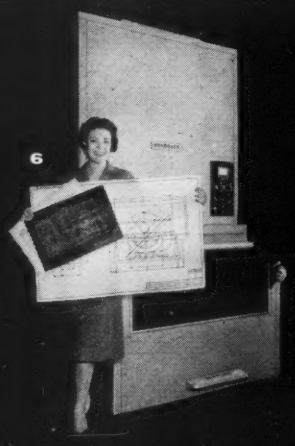
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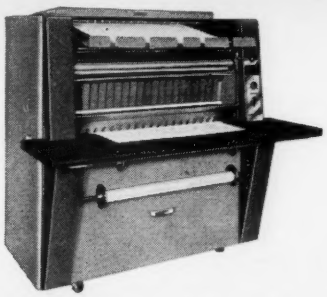
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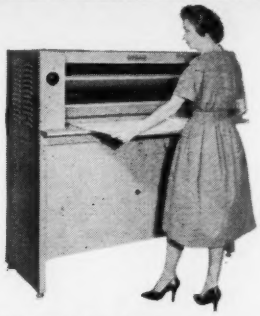
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3

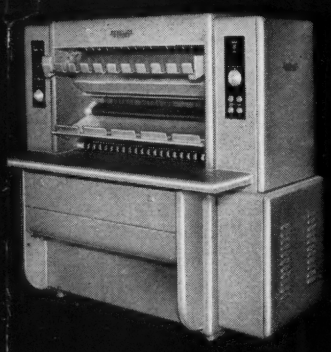


COPYFLEX MODEL 430 . . . a low cost medium volume whiteprinter. It will handle standard 42″ rolls or multiple sheet feedings.

4

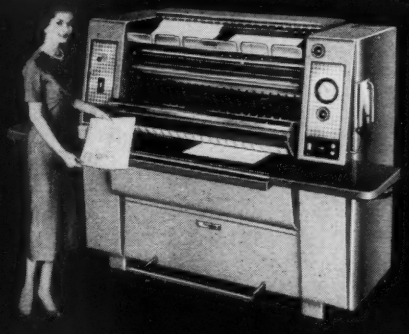


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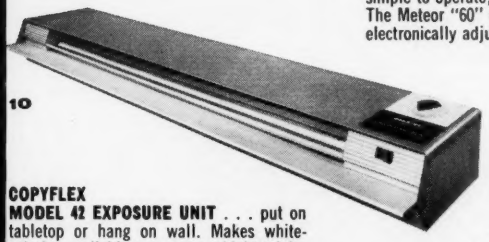
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COPYFLEX MODEL 675 . . . gives high volume reproduction. Low, streamlined and super-powered for high-quality, economical printing.

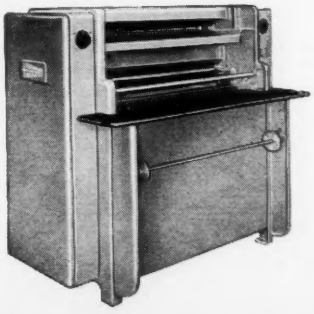
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simple to operate, easy to maintain.
The Meteor "60" is quiet in operation, with electronically adjusted speed.

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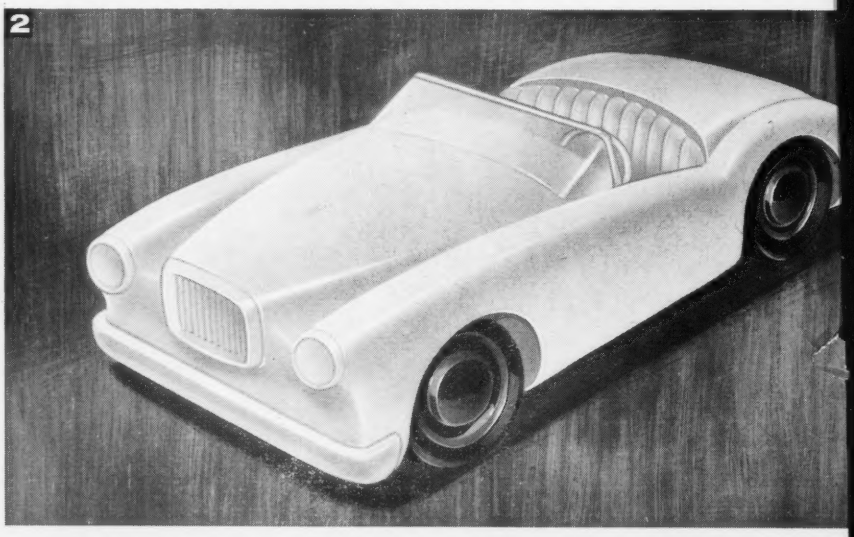
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NEWS ABOUT

FORTILENE* AND BLOW MOULDING

Sometimes a material and a process make a natural team—as in the case of Fortilene and blow moulding. Together, they make it possible to re-design products for better quality and greater economy.









1 DETERGENT BOTTLES. Blow moulded of Fortilene, these attractive bottles are convenient to ship and handle, light in weight and virtually indestructible. Fortilene offers complete flexibility in design and moulded-in colours.

2 TOY CARS. Blow moulding is even invading the toy field. This model sports car illustrates the realistic detail possible. Fortilene gives it strength, durability and colour.

3 HOUSEHOLD VAPOURIZERS. Leading appliance manufacturers are discovering the advantages of Fortilene and blow moulding. Fortilene is inexpensive and simple to mould, available in attractive colours and withstands boiling temperatures.

4 CARBOYS FOR CHEMICALS. Fortilene and blow moulding could cause a minor revolution in the chemical products field. Fortilene containers won't rust, dent or leak, and are not affected by acids.

TO HELP YOU solve your plastics problems profitably, Canadian Chemical will be glad to send you literature and technical bulletins on Fortilene, and to supply on-the-spot assistance through their sales staff. Please call your Canadian Chemical office.

CANADIAN CHEMICAL COMPANY, LIMITED
Montreal • Toronto • Vancouver

Chemcell® PLASTICS

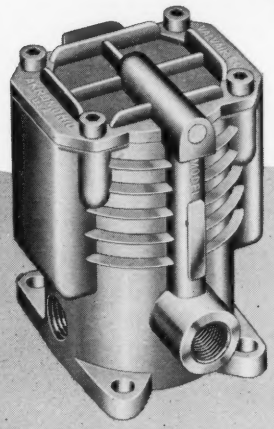
*Reg'd Can. Trademark

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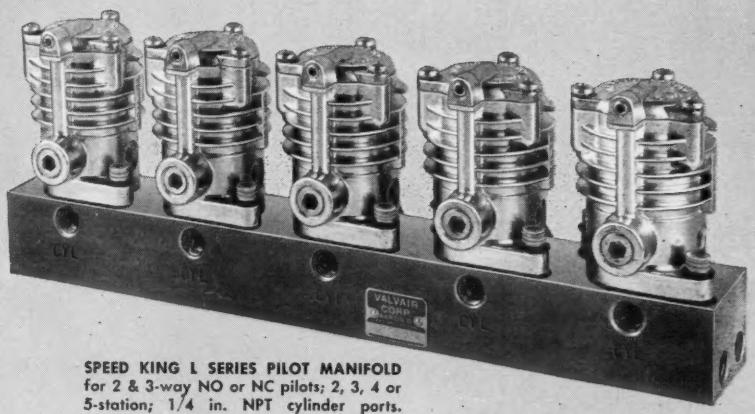
for dependable, economical control, specify versatile...

SPEED KING®

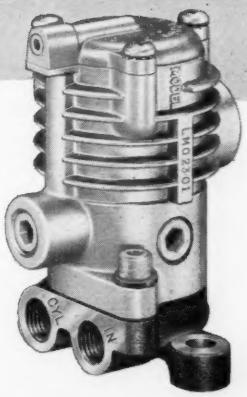
SOLENOID PILOTS



SPEED KING P SERIES PILOT 2 & 3-way NO & NC, 4-way; foot, sub-base or manifold mounting; 1/8 or 3/16 in. orifices. Foot mounting shown.



SPEED KING L SERIES PILOT MANIFOLD for 2 & 3-way NO or NC pilots; 2, 3, 4 or 5-station; 1/4 in. NPT cylinder ports. 5-station shown.



SPEED KING L SERIES PILOT 2 & 3-way NO & NC; foot, sub-base on manifold mounting; 1/16 to 1/8 in. orifices. Sub-base mounting shown.

Compact Valvair® SPEED KING pilots are ideal for control of small air or vacuum-operated devices including cylinders up to 3 in. bore, as well as for piloting larger valves. Featuring Valvair's flow-thru cooling design, they offer multi-million cycle dependability, with solenoid coils guaranteed against burn-out for the life of the valve. Choose from a full range of types, mounting styles and sizes; integral junction boxes (L Series only) and manual over-ride optional; coils for ac or dc, any voltage.

Solve your small unit control problems with SPEED KING solenoid pilots. Your Valvair or Bellows Field Engineer can recommend a size and type exactly suited to your requirements.

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FOR FASTER · SAFER · BETTER PRODUCTION

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Write for free Bulletin PIL. Address: Bellows-Valvair Ltd., Toronto 18, Ontario. Dept. DE-660.

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ANNOUNCING A NEW CORPORATE NAME

for The Garlock Packing Company of Canada Ltd.

Garlock of Canada Ltd. becomes the new name for The Garlock Packing Company of Canada Ltd., to reflect more accurately its broad diversification of products and markets

Originally established to manufacture mechanical packings, Garlock now produces over 2,000 different styles of packings, gaskets, seals, molded and extruded rubber and plastic products for every major industry.

The new corporate name, Garlock of Canada Ltd., more closely identifies this 73-year-old company with the growth and development of its product lines. *Today, industry goes to Garlock for such widely diversified products as:*

- Hydraulic-Pneumatic Packings
- Oil and Grease Seals
- Gasketing and Expansion Joints
- Braided Packings
- Molded and Extruded Rubber Parts
- Plastic Stock Shapes and Fabricated Parts
- Mechanical Seals
- Metal Packings
- Leather Packings
- Electronic Components
- Dry Bearings
- Fluorocarbon Tank Linings
- Missile and Rocket Components

To help you in selecting or applying any of these products, Garlock offers the service of hundreds of thoroughly-trained sales engineers, manufacturers' representatives, and authorized distributors throughout the United States and Canada. Conveniently located warehouses and stocking points assure Garlock customers of prompt delivery.

At Garlock of Canada Ltd., design and development of new or improved products and materials is an ever-present objective. To this end Garlock maintains extensive research and laboratory-test facilities. In addition, Garlock engineers and chemists are always ready to work with you in seeking solutions to tough application problems.

GARLOCK

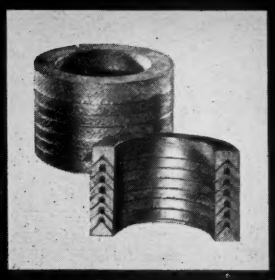
To find out more about "the new Garlock," call the nearest of our 26 sales offices, or write to Garlock of Canada Ltd., Toronto, Ont. *To assure prompt attention,* please refer to Garlock of Canada Ltd. on all future correspondence and orders.

Branch Offices: Hamilton, Montreal, Winnipeg, Edmonton, Vancouver

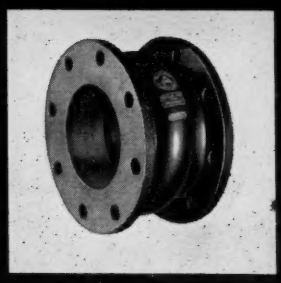
Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products

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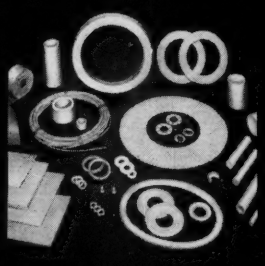
Hydraulic-Pneumatic Packings



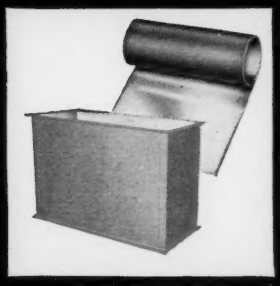
Expansion Joints



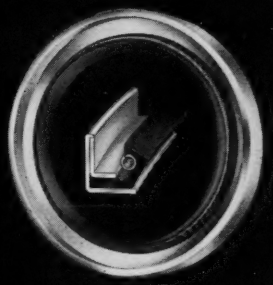
Molded and Extruded Rubber Parts



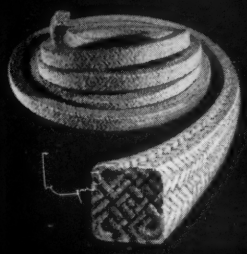
Plastic Stock Shapes
and Fabricated Parts



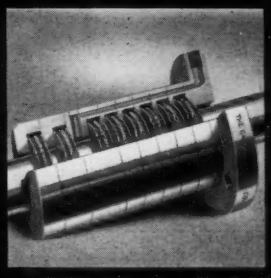
Fluorocarbon Tank Linings



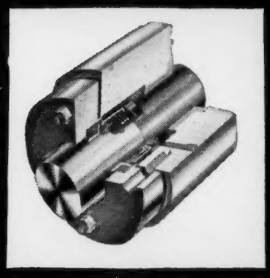
Oil and Grease Seals



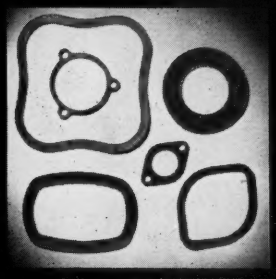
Braided Packings



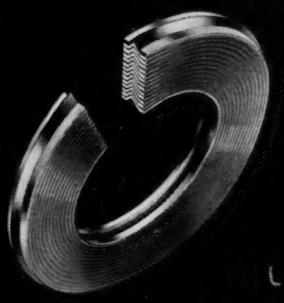
Metal Packings



Mechanical Shaft Seals



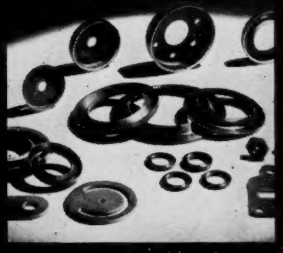
Gasketing



Spiral Wound Gaskets



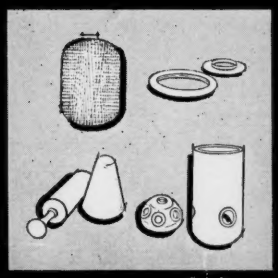
Dry Bearing Material



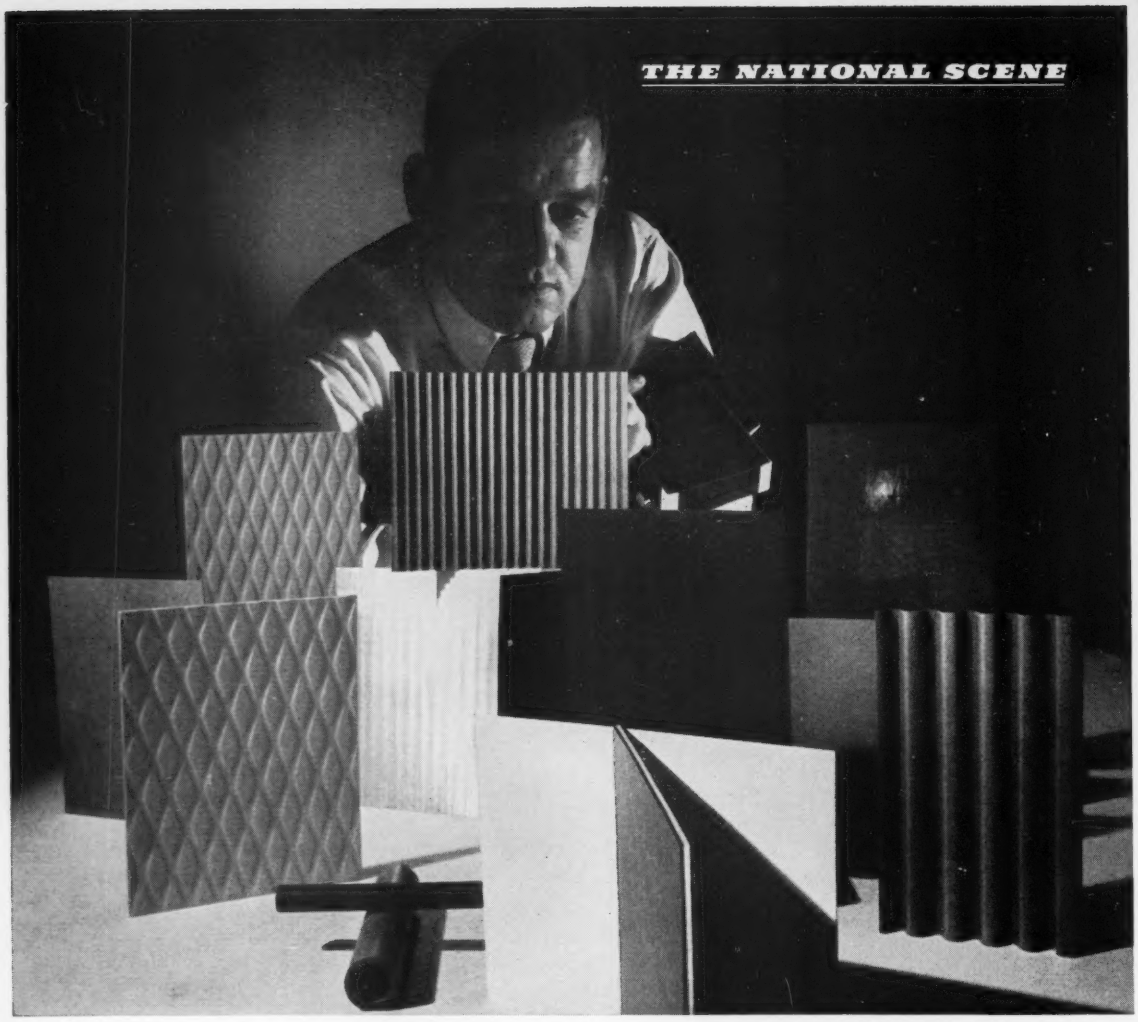
Leather Packings



Electronic Components



Missile and Rocket Components



"Here's a boxful of cost-cutting, product-improving ideas for you"

In versatility, performance and cost, Vulcanized Fibre may help crack your next design problem

For proof, look at this National product and its almost unbelievable range of uses. To name a few: delicate surgical instruments; rail joint insulation for railroads; clothes hampers for the home; dense, durable gears and cams; flexible backings for abrasive disks; arc chutes for lightning arrestors; motor insulation; punched tape for data processing machines; formed athletic guard equipment.

Among engineering materials you'll find National Vulcanized Fibre unique and surprisingly economical. It weighs only half as much as aluminum. It has unsurpassed arc resistance, low thermal conductivity, excellent resilience and high abrasion resistance. It absorbs sudden and repeated shock and impact without failure. And it is available in a fire resistant grade.

After 100 years, users are still finding new things they can do *to* Vulcanized Fibre. It can be machined, polished, painted, embossed, lacquered and combined with other materials, such as laminated plastic, aluminum, wood, rubber, asbestos or copper. It can even be formed or deep drawn into intricate shapes. Available in both standard and special forms and sizes.

Send for our special kit of samples (shown above)—write on your letterhead please—and evaluate the design possibilities personally. Let us know what use you have in mind. We'd like to help. National Fibre Company of Canada, Ltd., Dept. N-6, Toronto 3, Ontario.

NATIONAL

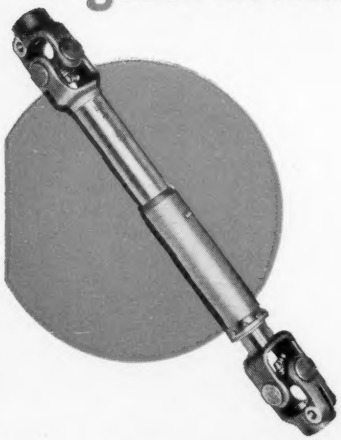
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BLOOD BROTHERS jointed steering assembly guides giant LeTourneau-Westinghouse coal hauler!



No matter how large the equipment you design, there's a Blood Brothers steering or jointed driving assembly big enough to do the job. One example of the use of Blood Brothers components on large equipment is the L6S Steering Assembly on the LeTourneau-Westinghouse Haulpak Coal Hauler.

This mammoth, highly maneuverable "mountain mover" is a bottom-dump 450 h.p. diesel unit that weighs 37 tons. Yet it carries 2½ *times* its own weight in payload, or the equivalent capacity of over one and one-half standard 50-ton railroad cars!

Rockwell-Standard's Universal Joint Division offers you a wide range of specialized engineering experience—involving everything from manual steering assemblies . . . to power take-off drives . . . to heavy-duty propeller shafts. Whatever size and type equipment you manufacture, Rockwell-Standard can save you time, money – help you achieve higher standards of performance. Let us prove it—on your project!

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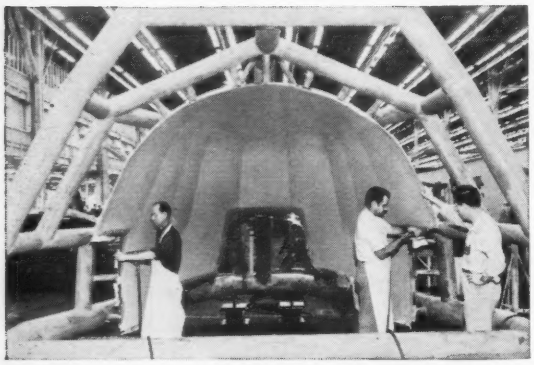
1 The tube is a reinforced epoxy housing that protects:
(a) a communications antenna *(b) a radio transmitter*
(c) miniature rockets



2 Its ignition coil, completely embedded in epoxy, is safe from:
(a) moisture *(b) temperature extremes*
(c) shock

Can you pass this test on Epoxy Plastics?

(You'll profit by knowing them better)



3 This airplane construction tool of epoxy-glass cloth:
(a) checks dimensions of fuselage *(b) supports the frame*
(c) is part of the mock-up



4 This tough, strong, pleasure boat hull is made from:
(a) laminated epoxy and glass fiber *(b) epoxy-coated wood*
(c) epoxy-coated metal



5 Their trip to school is safer in a bus with:
(a) epoxy-glass fiber seat frames *(b) an epoxy-sand coated floor*
(c) epoxy-embedded electrical parts

ANSWERS... *to tomorrow's needs are coming from adaptable BAKELITE epoxy plastics.*

1. Check (a). It minimizes weather and electrical interference along our defense communications lines.
2. Pick (a), (b), and (c)—and epoxy won't harm delicate windings, either.
3. (a) Checks dimensions—it's lightweight and extremely accurate.
4. (a) Epoxy-glass laminate—but epoxy coatings are great on other hulls.
5. (b) They won't slip on this floor's tough, gritty surface.

If you have questions—about epoxies and their potential for your business—please ask us. Why not discuss the matter with a Bakelite Technical Representative? Just write or call any of our offices, or write Bakelite Company, Division of Union Carbide Canada Limited,
40 St. Clair Ave. East, Toronto 7.

UNION CARBIDE

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Photo courtesy
LITHO-STRIP CORP.

ALUMINUM

Bonderized and painted coil...

a revolution in product quality and performance

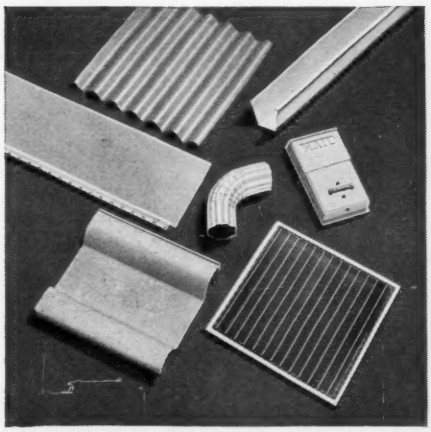
Bare aluminum enters the finishing installation and is cleaned, Bonderized and roll coat painted in continuous automated operation. Re-coiled, it's ready for forming into any one of dozens of products.

This is the most efficient, effective and economical method for painting aluminum. Straight-line production is utilized, labor and material costs are reduced, quality is maintained and the performance of the finish is spectacularly increased.

Paint adhesion over the Bonderite coating is so strong that it permits the most severe forming operations without peeling or failure.

Service life of paint over Bonderized aluminum—5 to 10 times that on untreated aluminum—assures product performance and customer satisfaction.

Aluminum, Bonderized and painted in the strip, is being used in huge tonnages today. Better investigate its economy and advantages for your production. Call in the Parker representative now!



Typical products formed from aluminum, Bonderized and painted in the strip.

Parker Rust Proof Company
OF CANADA, LIMITED
Rexdale Blvd., Rexdale (Toronto) Ontario

BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

Since 1914—Leader in the field

*Bonderite, Bonderized, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PROTECTED BY Bonderite PARKER RUST PROOF CO. QUALITY CORROSION RESISTANT

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Hot Wound



Hourglass



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Spiral



Starter



Swivel End



Torsion



Valve



Variable Pitch



Volute

springs

and other things

from the Engineering Team at Wallace Barnes.

These are just a few examples of the many thousands of different springs produced by Wallace Barnes in lots of a few . . . or thousands. The successful production of this large variety depends on the knowledge and experience of the Wallace Barnes team of engineering experts. These men, skilled in every phase of spring-making, guarantee the most efficient design, the most durable product, and the most economical production in any quantity.

Send for your FREE copy of "*Pocket Guide to Springs and Other Things*". A pictorial guide of our products and services.



Assemblies



Catches



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Clips



Electronic Coils



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Terminals



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Wire Forms

Just call the man  from Wallace Barnes



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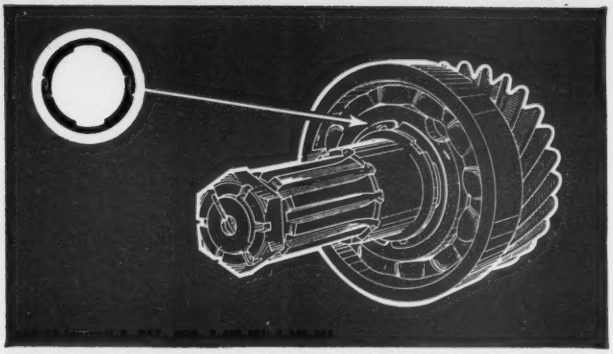
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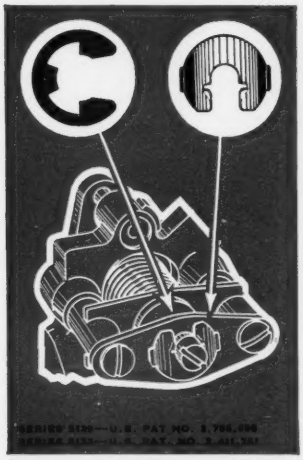
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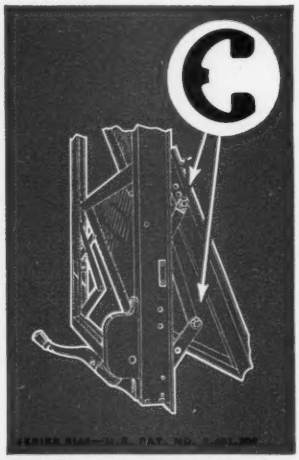
Designing with radially assembled Waldes Truarc retaining rings



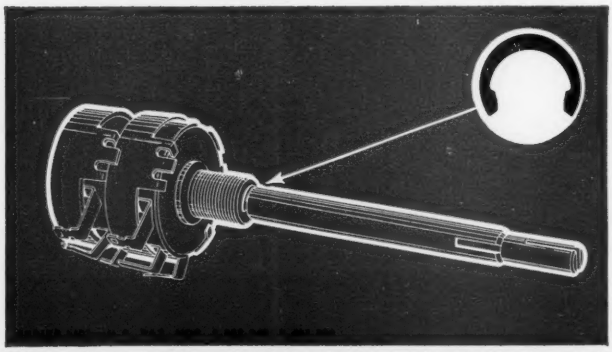
Heavy duty transmission design simplified. On this dual axle drive for trucks, a Truarc Series 5107 ring locks bearing on drive shaft. Interlocking ring design won't dislodge under heavy torque . . . is also recommended for high rpm. applications.



Rings replace machined shoulders, collars, set screws. That's what original design of this pneumatic temperature transmitter called for. Series 5139 Prong-Lock® ring with bowed design compensates for accumulated tolerances in parts, provides sufficient friction to prevent rotation under vibration. At the same time two Waldes E-rings position and lock adjustment screw to face plate.



Reinforced aluminum ring gives design advantages on louver windows. Waldes Truarc Series 5144 reinforced rings of aluminum secure hinge pins, eliminate costly riveting in linkage of louver type window. Ring design provides large bearing shoulder. Reinforced construction has 5 times the gripping strength of standard E-ring construction, allows use of non-corrosive aluminum.



Ring acts as locking shoulder. Holding the threaded ferrule on this potentiometer shaft is a Truarc Series 5103 Crescent® ring. Crescent ring design with low shoulder provides ample clearance for assembly of panel locknut. It is less costly than a machined shoulder, more effective, quicker to install, easier to remove than the C washer previously used.

solve varied product design problems—save machining, materials, parts and labor

Radially assembled retaining rings, which snap onto a shaft at right angles to its axis, greatly extend the range of products on which retaining rings may be used to simplify design and save parts or labor costs.

For example, rings for radial assembly can be used in applications where it is impossible to install a ring axially over the end of a shaft. Certain types are designed to accommodate shafts of relatively wide tolerances. Others described below may be used to provide a sizeable shoulder on a shaft.

The four applications shown here provide an indication of the wide range of products using radially assembled rings. The rings themselves are basic Truarc types each having specific design features. The high shoulder of one provides a large bearing surface on small diameter shafts; the low shoulder of another is ideal where clearance is limited. A third has an interlocking design which prevents it from being dislodged under torque or high rpm. A fourth can be used against rotating parts at the same time it provides spring tension.

These are but four of Truarc's fifty functionally different types of retaining rings with up to 97 sizes within a single type, six metal specifications and thirteen different finishes. Special hand, magazine, and semi-automatic applicators as well as grooving tools are also available to speed production. The entire line, together with over 70 typical applications, is described and illustrated in the new catalog RR10-58—yours for the asking.

Available in Canada from:

LYMAN TUBE AND BEARINGS, LIMITED

Head Office: 5420 Pare Street, Montreal 9, Quebec.
Branch Offices: Toronto, Winnipeg, Vancouver, New Glasgow, N. S.

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WALDES TRUARC® RETAINING RINGS
Waldes Kohinoor Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS...THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS

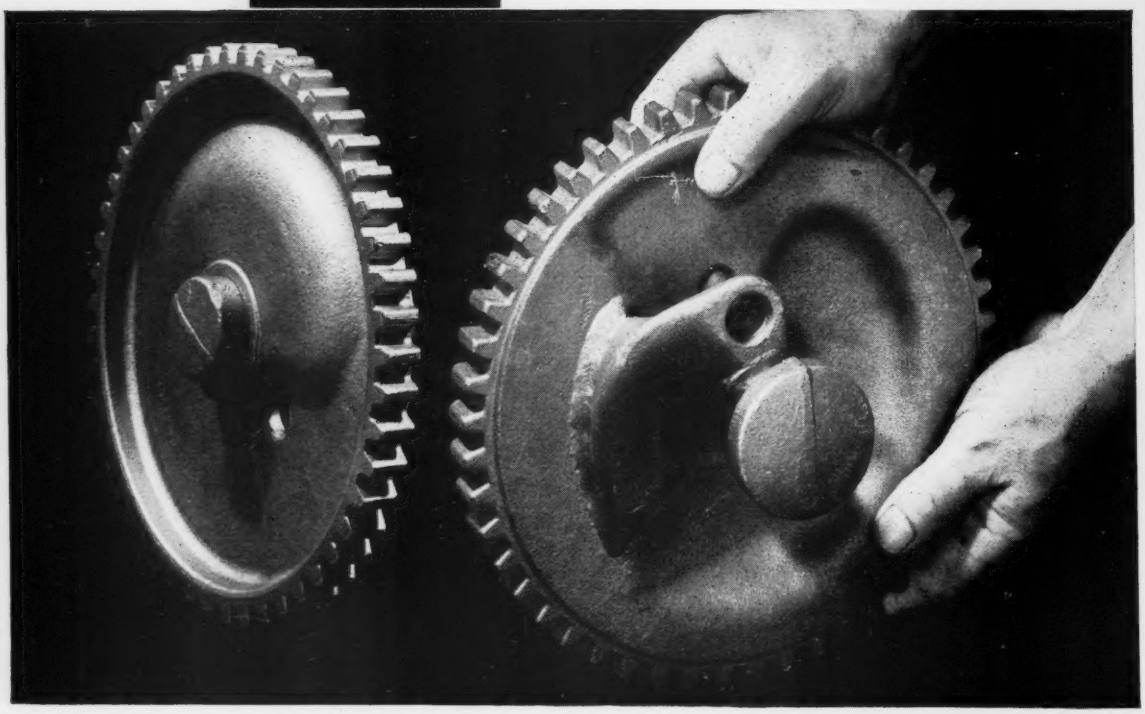
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STELCO

DROP FORGINGS

information

Send your request for regular mailings of the Stelco bulletin "Drop Forgings Information".



Please quote reference No. 159 when enquiring.

STELCO DROP FORGING PUTS TEETH IN GEARS

Now, Stelco forges Toothed Gears to customer specification. These gears, in common with all quality forgings, are strong, reliable, and durable, and offer substantial economies from less machine finishing. Stelco welcomes enquiries on specific applications.

Only quality steels can be successfully forged, and the process itself improves the strength of the steel by compressing its grain structure. By careful and experienced designing of the forging dies, grain flow can be controlled to fit the contours of the forgings, resulting in much higher tensile strength and fatigue resistance than in comparable machined or cast parts.

The patented welded gear assembly shown in the unretouched photograph above was drop forged to the customer's design.

Consult Stelco's Forging Engineers to determine the savings and improvements that can be obtained through the use of forgings in *your* operations.

BUY CANADIAN

Drop Forge Division

THE STEEL COMPANY OF CANADA, LIMITED

Drop Forge Division, Gananoque, Ontario

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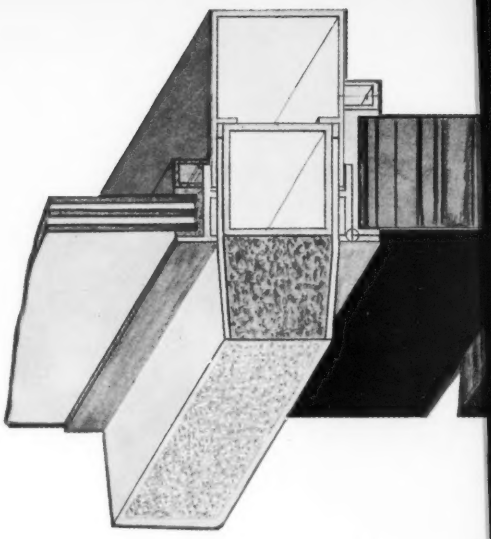

POLYFIBER
takes the measure
of "the impossible"
POLYFIBER LTD.
RENFREW, ONTARIO
SPECIALISTS IN DESIGN,
DEVELOPMENT AND PRODUCTION OF
FIBERGLASS REINFORCED PLASTICS.

Fiberglass reinforced plastic by POLYFIBER is a thousand-and-one things in industry. To the engineer it is steel and concrete . . . to the builder it is brick and lumber . . . to the manufacturer, alloys and ceramics . . . to the architect, glass and marble.

POLYFIBER is setting a fast, creative pace in revealing startling answers to industry's many production problems . . . in designing, developing and producing undreamed of products with materials hitherto associated mainly with the specialty business.

To your problem, POLYFIBER brings a dozen years' experience in developing and producing reinforced plastic products for all kinds of industrial and defence projects. In POLYFIBER's modern molding plant, covering a 40,000 square foot area, skilled engineers and craftsmen work with the finest equipment in the production of developed products as well as new ones.

Reproduced here are a few of the problems our creative-minded team of specialists have been asked to solve, and have solved — spectacularly.

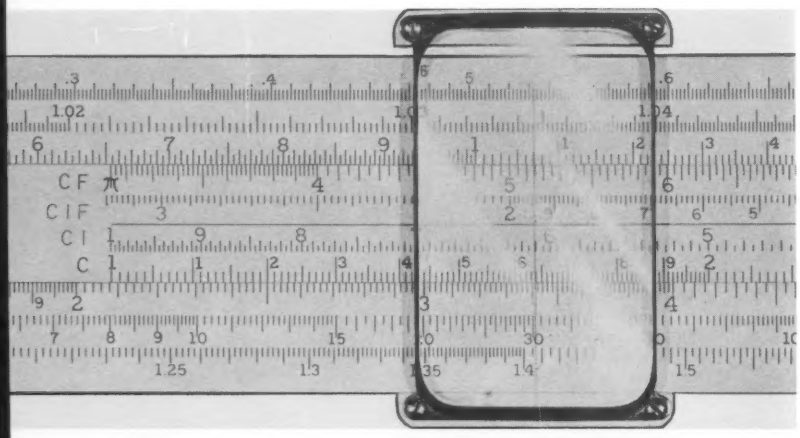


the problem:

In designing the vertical wall sections and sun-breaking fins separating the large glass panels forming the walls of Carleton University Library the architects were searching for contemporary materials which would have the same basic elegance as marble and enamelled steel.

the solution:

POLYFIBER was consulted and development work began immediately. The result — a lightweight monolithic panel incorporating both interior and exterior wall finishes plus insulation and vertical fins! And the 15′ by 2′ panels weighed only 80 pounds each, reducing costs substantially through ease of handling alone. For this outstanding development POLYFIBER won the 1960 CANADIAN PLASTIC ACHIEVEMENT AWARD.



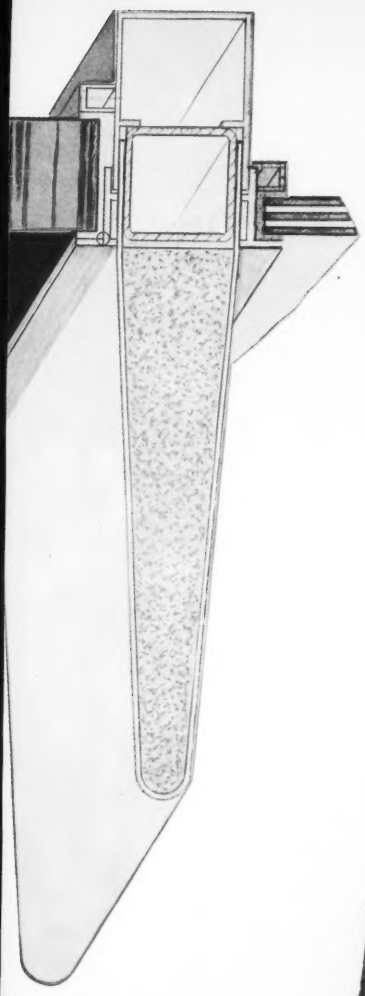
the problem:

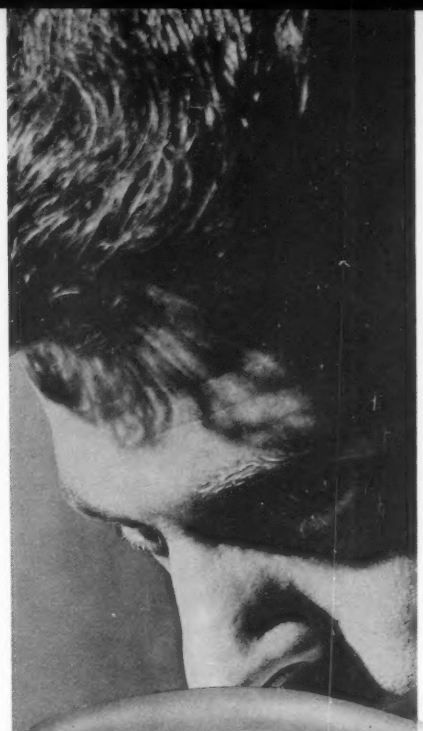
To develop a park bench that would withstand year-round use and exposure to extremes of weather, yet which was functional, comfortable and good-looking.

the solution:

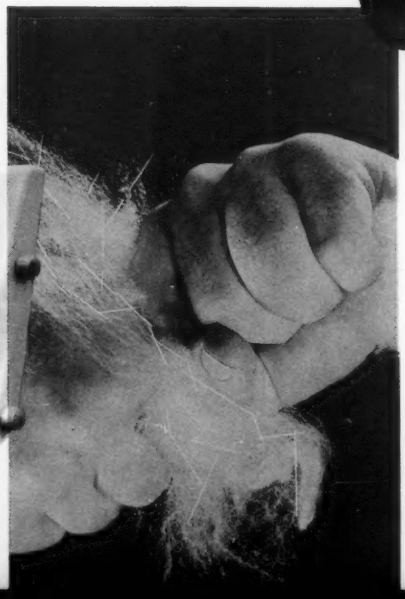
POLYFIBER designed a pressure-molded seat that could be erected in sections for greater flexibility and comfort, plus broad color variation. Fiberglass epoxy molds for permanent concrete bases were designed and are now being supplied for municipalities to cast their own with surplus labor during off-season periods. The POLYFIBER bench won a NATIONAL INDUSTRIAL DESIGN COUNCIL and a CANADIAN PLASTICS ACHIEVEMENT award for its functional beauty and originality. It has since been patented in Canada, the U.S. and Great Britain.











the problem:

Completely new truck body components. Time to develop, design, tool-up and manufacture? Two months!

the solution:

POLYFIBER took the measure of the impossible. The result . . . lightweight, low-cost body components, impervious to calcium and to weather, plus a translucent top for the back of the truck, to let in sunshine and daylight . . . developed and in production within the deadline. Other advantages are: elimination of fender dents, faster repair to damaged parts, increased payload due to reduction in body weight. And the biggest plus of all: tooling costs for fiberglass reinforced plastics are so much lower than for conventional metals.

Fiberglass reinforced plastics by POLYFIBER have a wide application in the mining, chemical, pulp and paper and allied industries because their resistance to most chemicals makes them ideal for storage tanks, piping, ducts, hoods and so on.

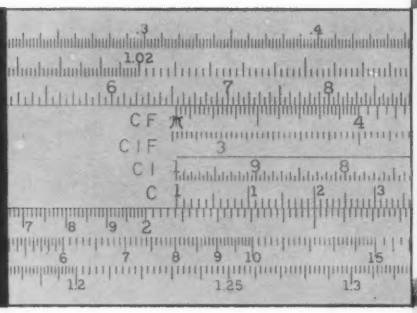


Whether you have an "impossible" problem — or an "every day" one — it will pay you to call on the people at POLYFIBER LIMITED. Their creative approach to your problem, backed by a wealth of experience in working in many highly specialized industrial fields, can mean greater efficiency and increased profits for your operation. Simply fill in the reply card below and mail to POLYFIBER LIMITED, Renfrew, Ontario.

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148 Lochiel St. North,
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I would like to know more about Fiberglass Reinforced Plastic and what this new material can do for us.

I'm particularly interested in reference to .....

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Company Name .....

Address .....

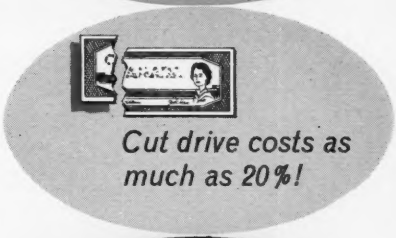
D. W. STEWART, P.Eng.,
President

A graduate of Queens University, Mr. Stewart has many years manufacturing experience in Canada and the U.S. He has undertaken important research work with the N.R.C. and is one of the pioneers in development of magnesium and aluminum castings in Canada. He has served on the Magnesium Committee, Federal Department of Mines and Resources; National Industrial Design Committee; Ontario Research Foundation; Eastern Ontario Development Association; the University Council and Board of Trustees of Queens University.

ERIC A. BROWN, P.E
Vice-President i/c sales
Engineering

Mr. Brown was born in A and graduated from the tute of Mechanical Engi London, England, in Shortly after his arrival i ada, in 1948, he played a ing role in developing a glass reinforced plastic tub for automatic washin chines resulting in the matched metal die pre-m ever mass-produced in country. Mr. Brown has b member of the Preform mittee of the U.S. since and is a member of S.P.I S.P.E.









High capacity Gates V-Belts assure reliable steering for muskeg truck

The big Nodwell Transporters, built by Robin-Nodwell Mfg., Ltd.,of Calgary, Alberta, are carrying up to ten ton loads of oil field equipment over mushy muskeg. Originally, the hydraulic pump for the steering mechanism was driven with a conventional V-belt drive. However, under the punishing driving conditions in muskeg, the belts quickly failed.

In the limited drive space available, a Gates Super HC V-Belt Drive was installed. The Gates Super HC is a high capacity drive that transmits up to 3 times more horsepower than a conventional V-belt drive in the same space. Today, these huge carriers are hauling full loads through muskeg under the most rigorous conditions. There have been no drive failures. Gates Super HC V-Belt Drives have proved entirely trouble-free, assuring reliable steering.

Gates Rubber of Canada Ltd.
Brantford, Ontario

GATES SUPER HC V-BELT DRIVES

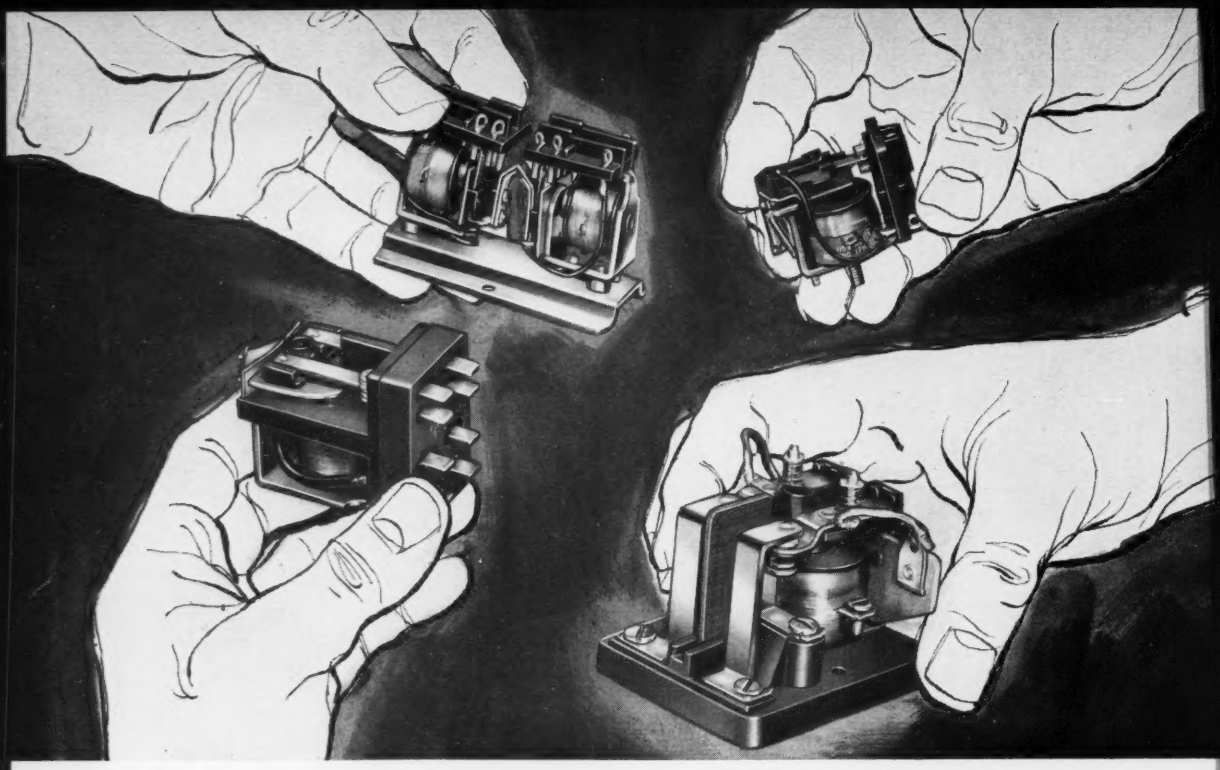
are the lowest cost, most compact, lightest-weight multiple V-belt drives you can put on any machine.

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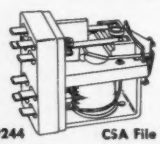
Type	Contact Arrangement*	Type	Contact Arrangement
PR1AY	SPST-NO	PR5AY	SPDT
PR3AY	SPDT-NO-DM	PR7AY	DPST-NO
		PR11AY	DPDT

These relays are available in any of the following operating voltages: 6, 12, 24, 115, 230 volts 50/60 cycles AC.

Contacts are rated at: 25 amps, 115/230 V. AC 1 phase 1 hp for 115/230 volt AC motors 1 phase.

*Read: NO normally open, NC normally closed, DB double break, DM double make.

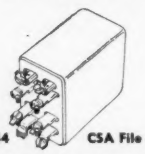
U/L File E22575 CSA File 1573



AB Series

U/L File E29244 CSA File 15734

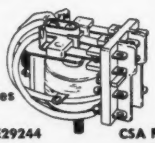
For appliance and general purpose operations requiring long life and quiet operation. Quick connect terminals. Screw terminal adapters also furnished with each relay. Contact arrangement: DPDT. Rated at 10 amps, 115 V., 5 amps, 230 AC non-inductive by U/L and CSA.



ABC Series

U/L File E29244 CSA File 15734

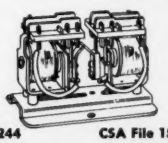
Medium duty power relay in dust cover. For small motors, industrial controls and similar applications. Contact arrangement: DPDT. Rated at 10 amps, 115 V., 5 amps, 230 AC non-inductive by U/L and CSA.



KA Series

U/L File E29244 CSA File 15734

Small, low cost, general purpose relay for handling automation work, small motors, solenoids, other relays. Contact arrangements: SPDT, DPDT and 3PDT. Rated at 5 amps, at 115 V., AC non-inductive by U/L and CSA.



KB Series

U/L File E29244 CSA File 15734

Compact latch relay ideal for memory work and overload applications. Operates on momentary impulse to either coil. Contact arrangements: 4PDT and 6PDT. Rated at 5 amps at 115 V., AC non-inductive by U/L and CSA.

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GUELPH, ONTARIO

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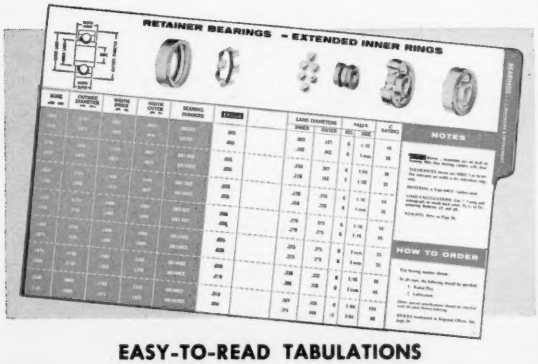
"...NEW MANUAL EXPANDS INFORMATION ON MINIATURE & INSTRUMENT BALL BEARINGS..."

By **GEORGE HAMPSON**, *Vice President-Sales, New Hampshire Ball Bearings, Inc.*

"... this 'Design & Purchasing Manual' replaces the first-of-its-kind 'Technical Data and Catalog' book NEW HAMPSHIRE published in 1957. As the 'Technical Data' (black cover) was then, we believe the 'Manual' (green cover) is now, the most complete source of information on miniature and instrument ball bearings in print. About 50 pages larger than the old book, the 'Manual' was expanded that much to include information developed since 1957 on ordering, maintaining, fitting, lubricating and testing miniature bearings."

QUALITY — AND ASSURANCE

"The significance of ABEC Class 7 tolerances to running quality of instrument bearings is covered in one section with a brief, to-the-point explanation of how improved bearing geometry helps the design and quality control engineer. A pictures-and-words story describes NEW HAMPSHIRE's Quality Assurance by which this high standard for miniature bearings is maintained in production. The equipment used, and how used, is fully described. Testing geometry and finish, cleaning and lubricating, functional testing of bearings, and metal research are some of the subjects covered."



EASY-TO-READ TABULATIONS

"An even easier-to-read tabulation form is used to list NEW HAMPSHIRE Bearings in Bore/OD/Width sequence for quick identification and selection when ordering or writing specifications. Three hundred seventy bearings are so listed, including NEW HAMPSHIRE wafers, the narrowest shielded retainer bearings possible for given Bore/OD combinations, and developed especially for manufacturers of synchros, servos, small motors, potentiometers, miniature gear trains, and other products where space-for-bearings is a problem."



BEARING NUMBERS EXPLAINED

"The 'Design & Purchasing Manual' includes a section on Designation, Packaging and Marking in which NEW HAMPSHIRE Bearing number symbols are explained, methods of packaging available from NEW HAMPSHIRE are described, and materials identification codes listed. Study of this section can work savings of money and time by minimizing the necessity of returning mistake-ordered bearings. In addition, simple HOW TO ORDER instructions are included on every page of bearing tabulations.
A Table of Weights is provided to assist those responsible for systems design and planning to compute weights of the NEW HAMPSHIRE Bearings specified and included."

ENGINEERING BULLETINS EXPANDED

"The Engineering Bulletins have been expanded and brought up-to-date to inform designers, engineers and quality control personnel of the latest developments related to Lubrication, Load Ratings, Fits, Speed, and other factors affecting performance and life of instrument bearings. There are now 22 Bulletins on as many subjects, including the two most recently developed, Duplex Bearings, and Bearing Roundness —one hundred seventeen pages of technical information on miniature and instrument ball bearings compiled and written by Bearing Engineers."

REGISTERED COPIES AVAILABLE

"The 'Design & Purchasing Manual' should be in the library of every designer, draftsman and buyer specifying or purchasing miniature and instrument ball bearings. Each copy is registered to its recipient. Your name and title sent to us on your company letterhead will bring your copy to you by return mail."



NEW HAMPSHIRE BALL BEARINGS, INC.
PETERBOROUGH, N. H.

In Canada: **Aeromotive Engineering Products, Inc., 147 Hymus Blvd., Pointe Claire, Quebec**

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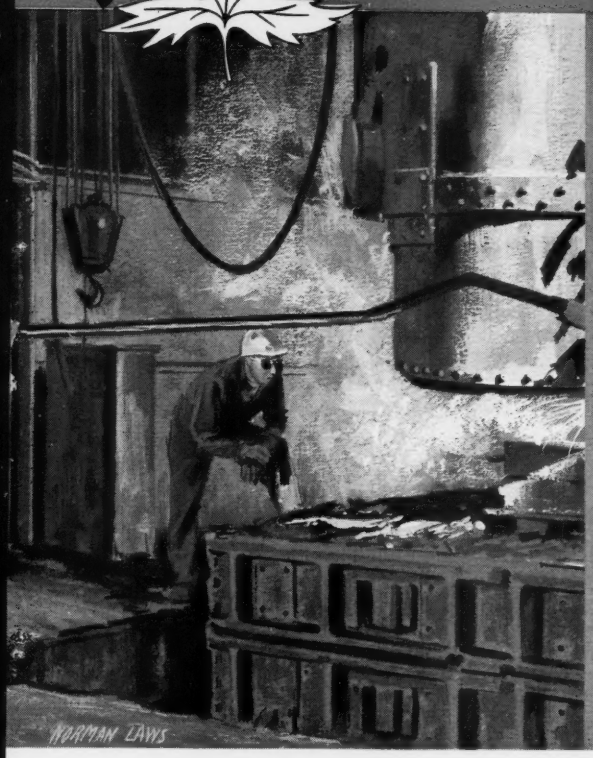
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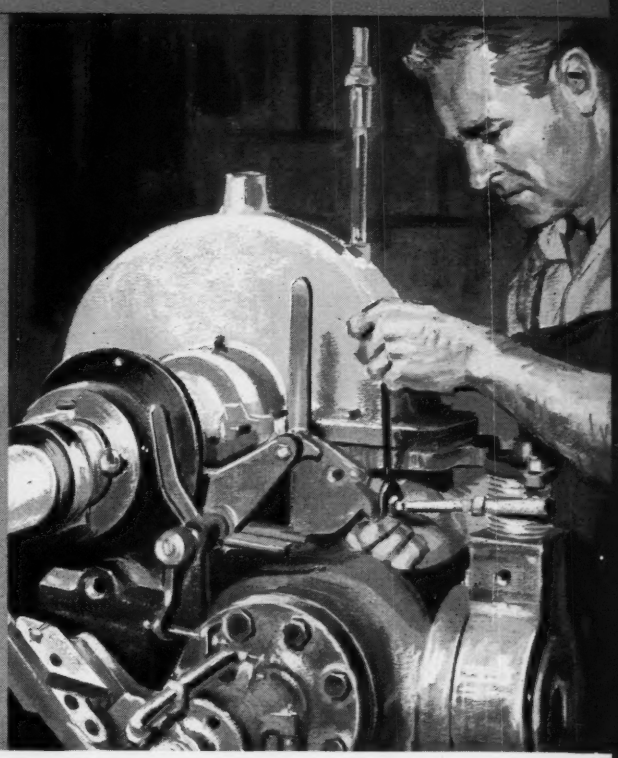
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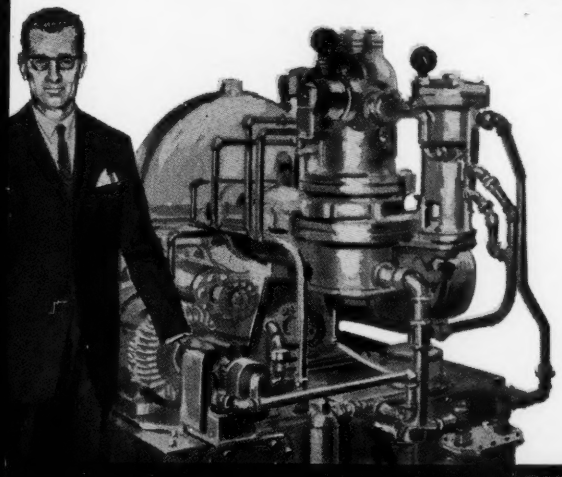
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Dofasco





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says T. L. Sweeney of Canadian Westinghouse

Westinghouse is a Canadian pioneer in the highly complex field of industrial steam turbines. These new Canadian-built steam turbines are second to none for dependability. As always, you can be *sure* if it's Westinghouse that *quality* comes first.

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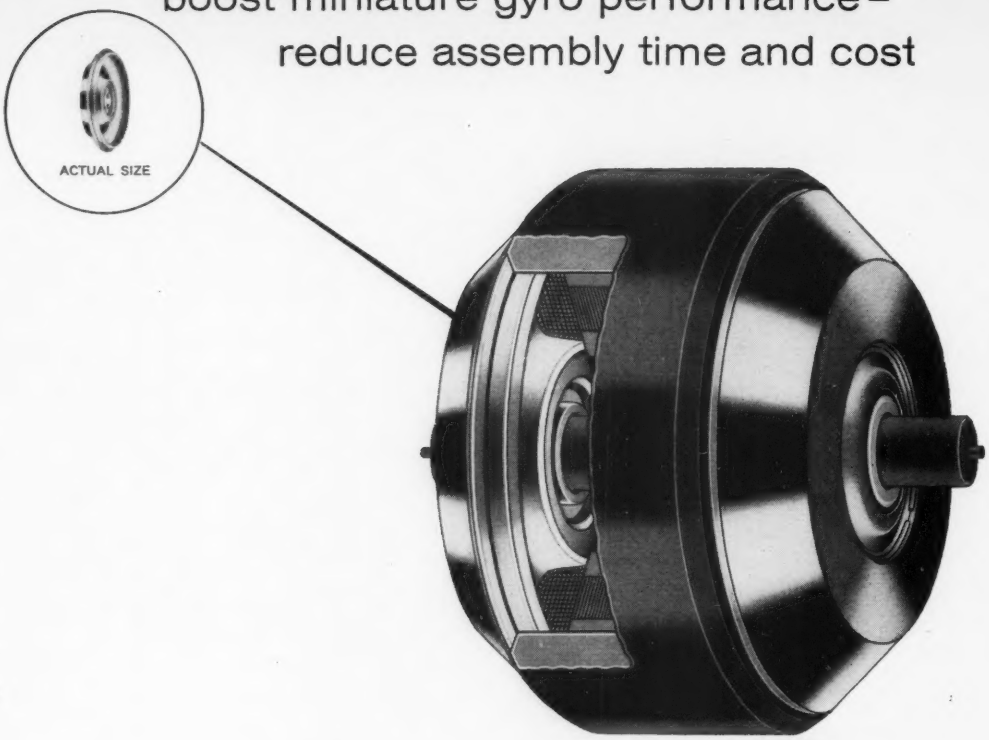
If quality is vital to *your* products too, call on Dofasco!

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HAMILTON, CANADA

Ask before you buy,
"IS IT MADE IN CANADA

5378

BARDEN end-bell bearings boost miniature gyro performance – reduce assembly time and cost



Integral design simplifies manufacture, reduces mating-part errors



Z155, *above and in main illustration,* is one of several Barden Precision end-bell bearings currently in volume production. Bore sizes range from .0781″ to .1250″ for through-bored rotor rings from .5751″ to .9375″ I.D. For complete technical information, write for Engineering Data Sheet Z-1.

Rotor bearings for miniature rate gyros in missile stabilizing systems must meet extremely high performance requirements, yet allow economical production and assembly. To solve this problem, Barden pioneered special configuration, high precision end-bell bearings.

Pressed into opposite sides of the through-bored rim, these bearings become an integral part of the gyro spin mass while serving as end caps for the gyro wheel assembly. This eliminates delicate fitting of very small bearings into conventional end bells . . . reduces mating-part errors and assembly time . . . improves squareness, concentricity, and overall accuracy and reliability.

One gyro manufacturer reports that the use of Barden Precision end-bell bearings in place of conventional flanged bearings reduced noise levels 50% and made it possible to meet unusually stringent life requirements.

Like other Barden advances in design and production, end-bell bearings solve a specific performance problem. Other Barden Precision bearings satisfy such extreme demands as:

- High temperatures (to 575°F.)
- Low torque (to 10 dyne-cm. for 2 lb. load)
- High speeds (to over 300,000 RPM)
- Concentric rotation (to .00005″ max. T.I.R.)

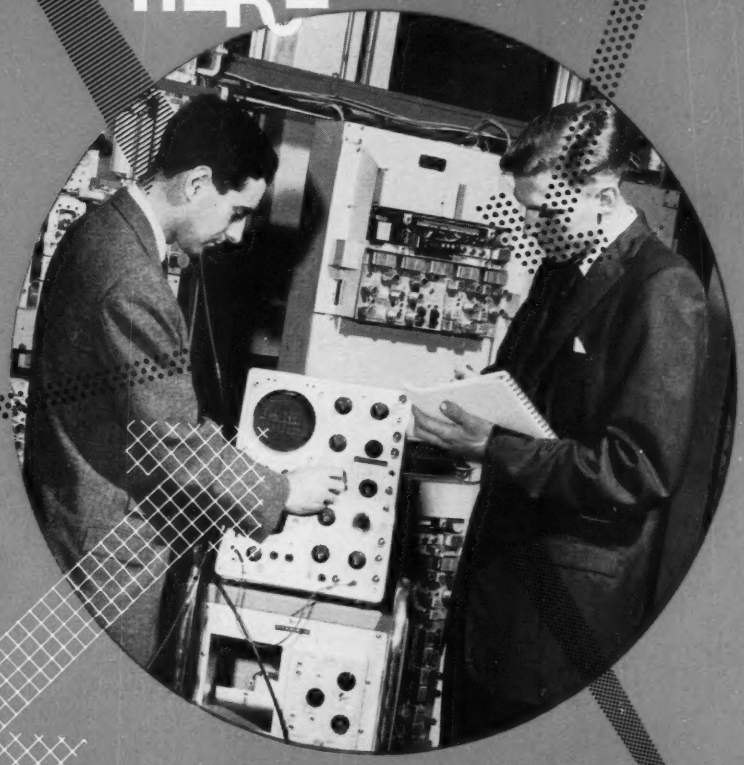
Barden is a major supplier of standard bearings in sizes from .0469″ bore to over 3″ O.D., all manufactured to Barden Precision standards of dimensional accuracy, uniformity and reliability. See Sweet's Product Design File (8h/Ba) for Barden catalog and bearing selection guide.

for reliability...specify **BARDEN** **PRECISION BALL BEARINGS**

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Research and Development Laboratories

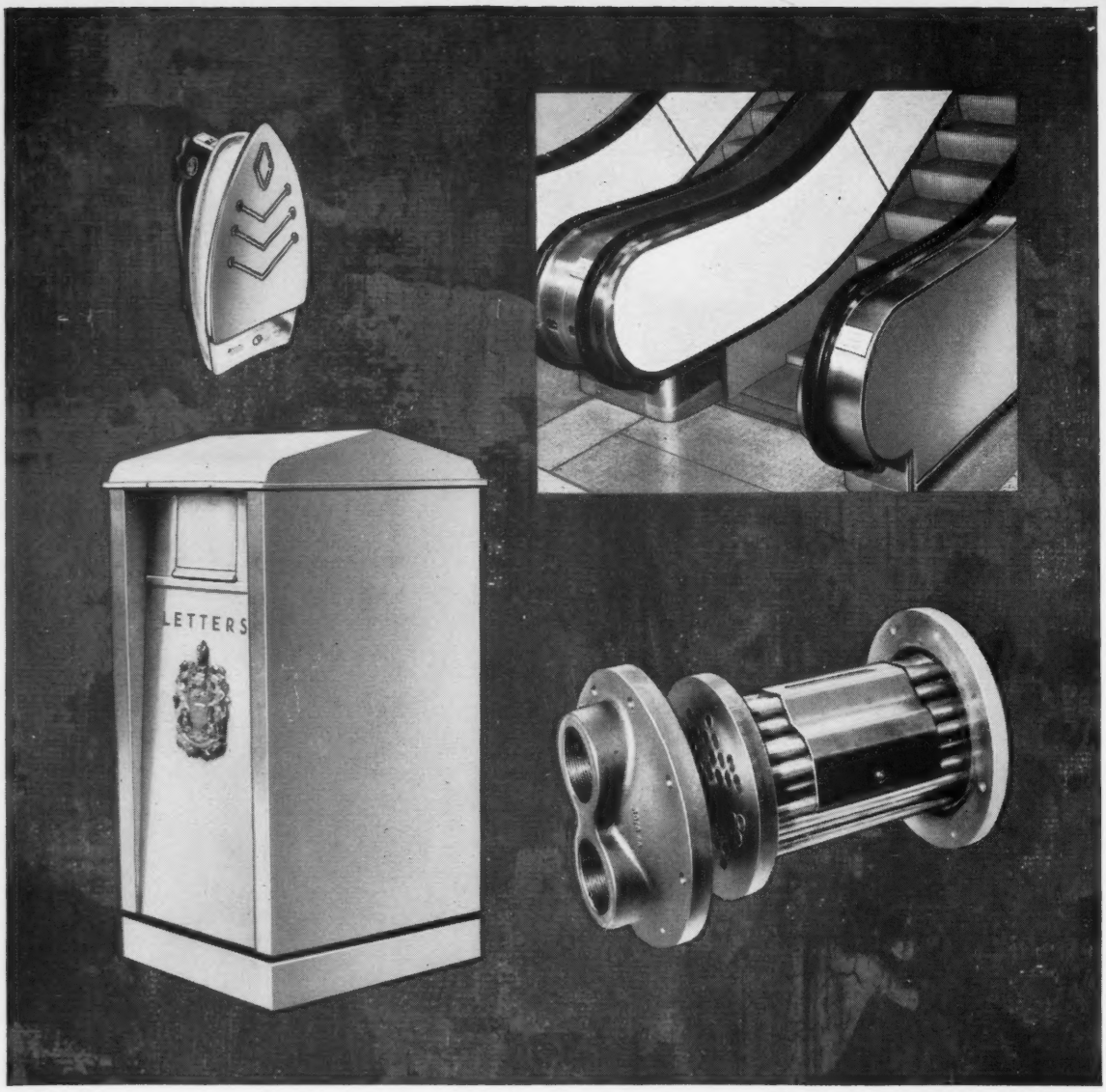
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Why Stainless?

First of all stainless cuts down on expensive operations because it is easy to work with. No tolerance is needed for corrosion because there *is* no corrosion—and stainless needs no painting or plating.

Investigate the possibilities of using stainless in *your* next project. In Canada the largest producer of Stainless Steels—and the company best equipped to assist you —is Atlas. For answers to your questions about steel, contact your nearest Atlas representative.

ATLAS STAINLESS STEELS

ATLAS STEELS LIMITED, WELLAND, ONT. Warehouses: MONTREAL, TORONTO, HAMILTON, WINDSOR, WINNIPEG, VANCOUVER. Representatives: LONDON, ST. CATHARINES, SUDBURY

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Design Engineering June 1960

Technique of designing with retaining rings

Oswald Kolbert

Fasteners play a critical role in product design. They have a direct effect on size and weight, ease of assembly and disassembly and costs for materials, machining and assembly time. Unless the design engineer has had substantial experience in the specification and use of different fastening methods, however, it is often difficult to select the fastener which combines optimum functioning characteristics with maximum production economies. A fastening method which is entirely suitable for one product design may leave much to be desired in another.

Stamped retaining rings are a relative newcomer to the fastening field. The first two basic types were introduced in the United States in 1942 for aircraft applications. Since then, demand for the rings in other industries has led to the development of a great many different types and sizes designed to satisfy a broad range of fastening requirements.

Purpose and function

Retaining rings are designed to function as removable shoulders for accurately positioning and locking components on shafts and in bores and housings. Most rings are installed in circular grooves which are pre-cut before the rings are assembled. Self-locking rings, which do not require grooves, also are available.

Unlike wire-formed rings, which have a uniform section height, stamped rings are characterized by a tapered radial width which decreases symmetrically from the centre section to the free ends. The tapered section permits the rings to remain circular after they have been expanded for assembly over a shaft or compressed for insertion into a bore. This constant circularity assures maximum contact surface with the groove bottom and is an important factor in achieving high static and dynamic thrust load capacities. Plier holes in the lugs at the free ends — another characteristic of the stamped ring — facilitate ring assembly and disassembly.

Design and production advantages

Retaining rings offer a number of design and production advantages over other fastening methods. By reducing the number and complexity of components in an assembly, the rings often make possible design simplification with substantial savings in size and weight. The rings eliminate drilling, tapping, threading and other costly, time-consuming machining operations often required with other fastening methods. Accurate location of ring grooves — which frequently can be cut simultaneously with other production processes — assures precise seating of components and eliminates objectionable binding or end-play. Rapid ring assembly and disassembly further reduce manufacturing costs and facilitate product maintenance and field service.

Most stamped rings are made of high-carbon spring steel. Aluminum, beryllium copper, phosphor bronze and corrosion-resistant stainless steels also are available for special applications. Standard sizes range from approximately ⅛ in. to 10.0 in. in diameter, although rings as large as 39 in. in diameter have

Dr. O. Kolbert is technical manager of the Truarc Retaining Rings Division of Waldes Kohinoor Inc., Long Island City, N.Y.



continued ▶

been manufactured for special applications. A good indication of the number of standard sizes available is the fact that, for some ring types, more than 30 diameters are produced between ⅛ in. and 1.0 in.



CRESCENT® RING



E-RING



REINFORCED E-RING



BOWED E-RING



LOCKING PRONG RING



GRIP RING



EXTERNAL CIRCULAR SELF-LOCKING RING



EXTERNAL CIRCULAR SELF-LOCKING RING



TRIANGULAR SELF-LOCKING RETAINER



TRIANGULAR NUT

Which ring to use

Retaining rings usually are grouped by function. "Internal" types — i.e., those used in bores and housings, include the following:

Basic internal ring: Incorporates the tapered construction mentioned earlier and, like other axially installed rings, has plier holes to facilitate handling during assembly and disassembly. The ring is designed to be seated in a deep groove and is secure against heavy thrust loads. In some sizes, it is manufactured with an extra-large free diameter and gap width to prevent permanent set and permit the ring to be seated in a deeper groove with higher thrust capacity. Basic internal rings often are used to replace bolted cover plates, flanges, threaded plugs and other threaded internal retainers.

Inverted internal ring: Differs from the basic type in that the section height has been increased and the lugs inverted to abut the bottom of the groove. While the ring has a somewhat lower thrust capacity than the basic type, it offers three advantages: better clearance, a higher uniform protruding shoulder and a more pleasing appearance. Inverted rings are recommended for retaining shielded bearings, lenses, seals and other components with large corner radii or chamfers.

Bowed internal ring: Designed for assemblies in which accumulated tolerances cause objectionable end-play between the ring and the retained part. The ring is bowed cylindrically around an axis normal to the diameter bisecting the gap. This construction enables the fastener to provide resilient end-play take-up in an axial direction while maintaining a tight grip against the groove bottom. Bowed rings are used widely for pre-loading bearings, providing spring tension on adjustment devices and preventing rattle in linkages. They are useful also for salvaging assemblies designed originally for flat rings where the groove has been cut too wide.

Beveled internal ring: Designed for rigid end-play take-up, the ring has a 15-deg bevel on the outer circumference. It is installed in a groove having a similar bevel on the load-bearing wall. Where end-play is present, the beveled ring serves as a wedge against the retained part, seating more deeply in the groove to compensate for accumulated tolerances or wear in the retained parts. Beveled rings are used in pressure pumps, automotive transmissions and other applications in which a tight seal is critical.

External rings

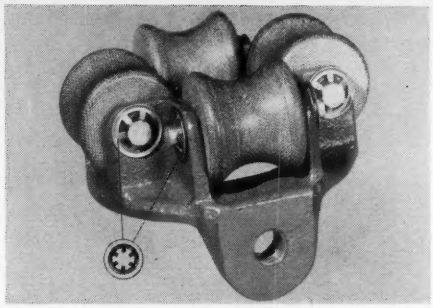
Stamped retaining rings used on shafts, pins, studs and bosses are known as "external" types. Two kinds are available: axially assembled and radially assembled.

The axial group includes **basic, inverted, bowed** and **beveled** rings similar in design to the internal types. The fasteners differ from the internal rings in that the lug positions are reversed and the inner circumference of the ring abuts the groove bottom. External rings are expanded for assembly and disassembly, in contrast to the contraction required for their internal counterparts.

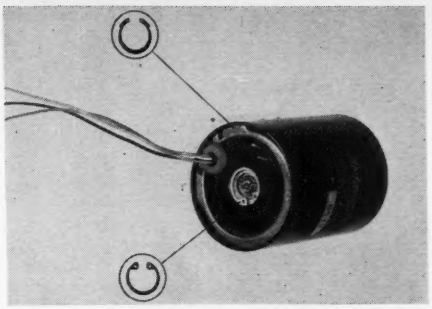
Axially assembled external rings are used in a wide variety of consumer and industrial products. These include automobiles, business machines, household appliances, electronic instruments and machine tools. They often replace cotter pins, nuts and threaded sleeves, machined shoulders, collars and set screws and many other fastening devices and methods which require expensive preliminary machining operations. Use of the rings often improves design and results in substantial reductions in size and weight.

Radially assembled rings

Limited clearance in an assembly often prohibits the use of an axially assembled retaining ring. Designers faced with this condition should consider various stamped rings which may be installed radially on a shaft directly in the plane of the groove. While such fasteners have lower thrust load capacities than the axial types, their holding power is adequate for many applications. The following rings make up the radially assembled group:



External circular self-locking rings are used to secure the rollers of this heavy-duty cable guide.



This drive motor uses a number of stamped rings to simplify design.

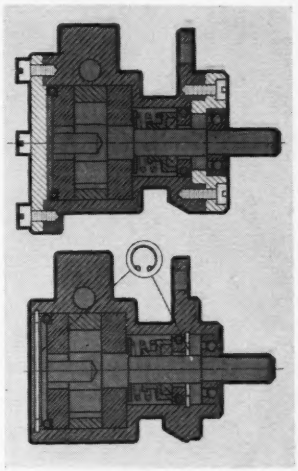
Interlocking ring: This is a two-part fastener consisting of identical semicircular halves which lock together by means of prongs located at the free ends. The ring is balanced to withstand high rotational speeds and is secure against heavy thrust loads. It provides a uniform, circular shoulder and, because of its attractive appearance, is used widely for exposed applications.

Crescent ring: Incorporates the same tapered construction characteristic of the basic axial types. The ring maintains a tight grip against the bottom of the groove and provides a uniformly circular shoulder on the shaft. Because of its narrow section, it is ideal for assemblies in which clearance dimensions are a critical factor.

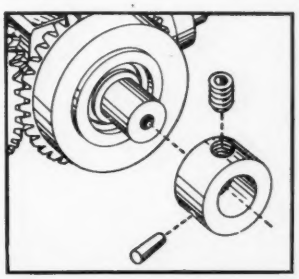
E-ring: Derives its name from three uniformly spaced prongs which grip the shaft and provide contact surface with the bottom of the groove. Designed to provide a large bearing shoulder on small diameter shafts, the fastener is used widely to retain springs, hinge pins and other linkages. Bowed E-rings are available for assemblies in which end-play take-up is required.

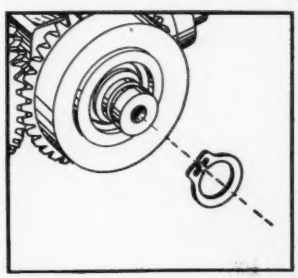
Reinforced E-ring: Provides approximately five times greater gripping strength and 50% higher RPM limits than standard E-rings. The fastener has a heavy web section and tapered bending arms, providing substantially greater spring pressure than conventional E-rings with no increase in permanent set. Because aluminum reinforced E-rings are stronger than conventional E-rings made of steel, they are especially suitable for exposed applications requiring both strength and corrosion resistance.

Locking prong ring: This is a bowed retaining ring which functions as a spring as well as a shoulder, providing resilient end-play take-up. Two prongs lock against the shaft, preventing the ring from being dislodged from the groove. The fastener has a high thrust-load capacity and may be used as a shoulder against rotating parts.



"Before and after" designs of this pressure pump illustrate how retaining rings may be used to eliminate parts and machining operations.





This precision differential originally used collars and set screws (top) to retain class V miniature bearings.

Selflocking rings

In many assemblies, retaining rings are not subject to any sizeable static or dynamic loading conditions but instead must serve merely as positioning and locking devices against moderate impacts and vibrations. For such assemblies, self-locking rings which do not require grooves offer many advantages.

The fasteners do not involve any preparatory machining operations and may be installed quickly with simple hand tools. They can accommodate large tolerances in shaft or housing diameter, an especially important advantage when castings or plastic parts are used. Because they may be seated at any point on a shaft or in a bore, they automatically compensate for accumulated tolerances in the retained parts.

Among the self-locking types are circular fasteners "grip" rings and various rectangular and triangular retainers. The circular, rectangular and triangular types generally have inclined prongs which bend from their initial position when they are locked in place. Most of these fasteners take a substantial permanent set and, as a result, cannot be reused after disassembly.

The "grip" ring looks somewhat like the basic external ring and is installed

continued ▶

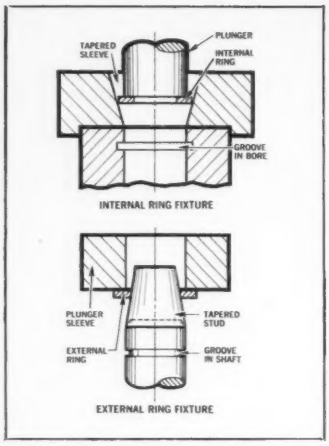
merely by being spread and snapped into position on a shaft. It exerts a frictional hold against axial displacement and may be reused after removal.

Calculation of load capacities

Ring and groove load capacities supplied by the ring manufacturer should be considered as limiting factors in assemblies where static or dynamic loading conditions will be encountered. If it is necessary for the designer to calculate ring and groove load limits, the formulas listed in the data sheet may be used.

The formulas are calculated for assemblies in which the abutting face of the retained part has a square corner. It is assumed also that there will be reasonably concentric uniform loading against the ring.

If the abutting face of the retained part has a corner radius or chamfer, the dimensions of the radius or chamfer should not exceed the allowable maxima listed by the ring manufacturer. The designer should make certain also that ring and groove load limits — which are substantially lower when the abutting face of the retained part has a radius or chamfer — are adequate for the assembly.



Representative assembly fixtures for axially-installed rings.

Ring assembly techniques

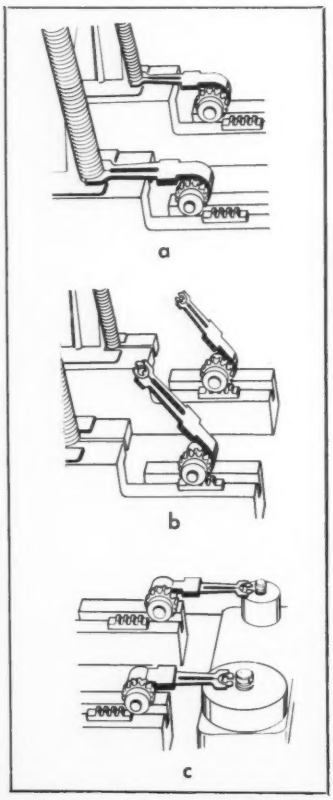
A number of assembly tools are available for rapid, economical installation and removal of retaining rings.

Among the most widely used hand-operated tools for axially assembled rings are pliers which grasp the rings securely by the lugs. Internal ring pliers are designed to compress the fasteners for insertion into a bore or housing; pliers for external rings expand the fasteners so that they may be slipped over the end of a shaft.

For most ring applications, pliers with straight tips are adequate. Where space is limited, however, the pliers may be obtained with tips bent to a 30-deg, 45-deg, 60-deg or 90-deg angle.

Pliers for large-size rings have a double ratchet construction which reduces the effort needed to compress or expand the rings. The ratchet locks the pliers at any given point of expansion or contraction and serves as a safety device for preventing the ring from springing loose accidentally.

Axially assembled rings may be installed also with a number of simple fixtures which can be made easily in most shops.



This unit, the Ring-O-Mat, is designed for mass production of installation of radially-assembled crescent rings, E-rings and reinforced E-rings.

Applicators and dispensers

Radially assembled rings may be installed rapidly with applicators and dispensers which can be operated at a high rate of speed even by unskilled operators. The applicating tools may be used with loose rings or with stacked rings supplied in special tape-wrapped cartridges designed especially for the dispenser.

Magazine-loaded assembly tools are a recent development designed for high-speed installation of radial-type rings. The tools combine an applicator and dispenser in one unit and are loaded with stacked rings much in the same manner as a stapling machine is loaded with staples. The tools are especially suitable for ring applications in which the work piece is too large to be brought to a fixed assembly station.

Mechanized assembly

Retaining rings lend themselves readily to a number of mechanized assembly techniques which can account for substantial savings in time and labor. Because every manufacturing operation is different, it is difficult to establish fixed rates of production at which it becomes profitable to install mechanized and automatic assembly machines and fixtures.

In general, however, when the rate of assembly consistently is between 500 and 1,000 rings per hour, automatic assembly with hoppered or stacked rings should be considered. If the rate is less than 500 per hour, whether or not mechanization will be profitable depends upon the individual application.

If a ring is used to retain a part on a shaft under spring pressure, for example, it may be difficult for the operator to compress the spring with one hand and mount the ring with the other. In such cases, a semiautomatic fixture will improve the operation and provide substantial savings, even if the production rate is low. Mechanization often is profitable also where two or more rings can be mounted simultaneously or where the operator must perform a complicated assembly involving a number of parts in a fixture. In such cases, automatic ring assembly can eliminate hand operation entirely.

Design Engineering DATA SHEET

Formulas for Calculating Ring and Groove Load Limits

LOADING CONDITION	FORMULA
Static thrust load on ring*	$P_r = \frac{S\ t\ \pi\ s_s}{F}$
Static thrust load on groove*	$P_g = \frac{S\ d\ \pi\ s_y}{F}$
Impact loading on ring	$I_r = \frac{P_r\ t}{2}$
Impact loading on groove	$I_g = \frac{P_g\ d}{2}$
Vibration loading on ring	$wa \leqq 540\ P_r$
Vibration loading on groove	$wa \leqq 400\ P_g$
Harmonic oscillation for ring or groove	$a \cong 40\ \rho\ f^2$
Allowable thrust load on ring when retained part rotates relative to ring	$P_{rr} \leqq \frac{s\ t\ h^2}{\mu\ 18\ S}$
Elastic deformation (temporary displacement of retained part under load)	$\delta = \frac{T}{E\ d}$

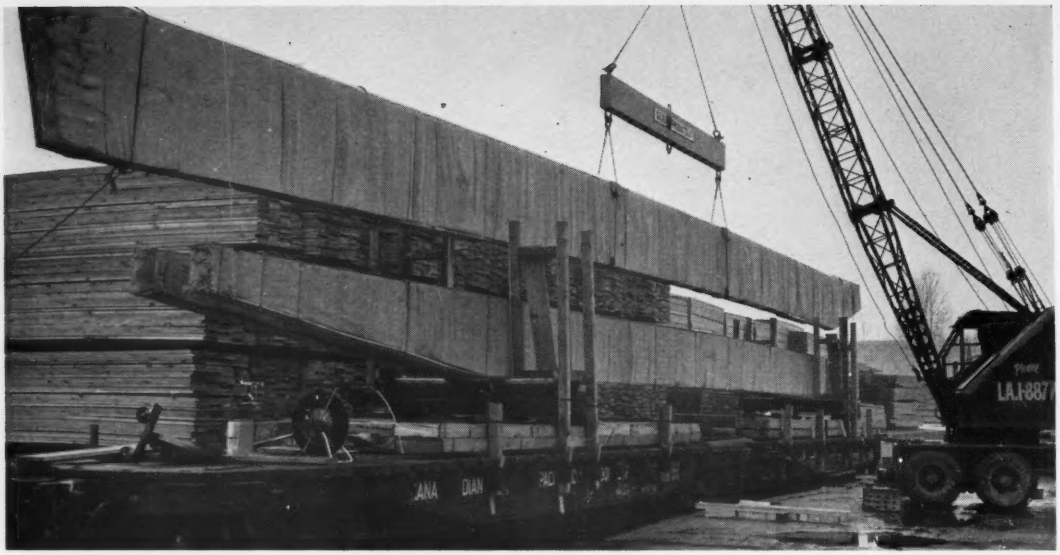
RING TYPE	Conversion Factor Ring P_r	Groove P_g
Inverted internal, external rings	2/3	2/3
E-rings (including bowed and reinforced types)	1/3	1/3
Crescent rings	1/2	1/2
Interlocking rings	3/4	3/4
Beveled internal, external rings	1	1/2

** Formulas for P_r and P_g apply to basic and bowed internal and external rings. For other ring types, it is necessary to Multiply P_r and P_g by the following conversion factors:*

DEFINITION OF TERMS

- a = acceleration of parts (in./sec.^{2})
- d = groove depth (in.)
- E = modulus of elasticity of groove material
- f = frequency (cycles/sec.)
- F = safety factor†
- h = largest section of ring (in.)
- I_g = allowable impact load on groove (in. lbs.)
- I_r = allowable impact load on ring (in. lbs.)
- P_g = allowable static thrust load on groove (lbs.)
- P_r = allowable static thrust load on ring (lbs.)
- P_{rr} = allowable rotating thrust load on ring exerted by adjacent part (lbs.)
- s = working stress of ring under maximum expansion or contraction (psi)
- S = shaft or housing dia. (in.)
- s_s = ultimate shear strength of ring material (psi)
- s_y = tensile yield strength of groove material (psi)
- t = ring thickness (in.)
- T = acting load (lbs.)
- w = weight of retained parts (lbs.)
- δ = deflection (in.)
- μ = coefficient of friction (dry parts 0.15-0.20)
- ρ = amplitude (in.)

† Varies with ring design and material. Value is 4 for basic steel internal and external rings.



B.C. firm laminates giant beam

Special camber used in Canadian design to compensate for sag

Art Joy, *Vancouver editor*

In a matter of hours a New Westminster firm has produced a giant laminated beam equal in size to some of the largest and oldest Douglas fir trees.

Produced by Glulam Products Limited, the beam is 106 ft long, 11 in. wide, and 56 in. deep. It weighs 16,885 lb—approximately 7,515 lb less than the weight of a steel beam of comparable strength. The new beam is the longest beam in these dimensions ever produced in Canada.

The beam was designed to act as the main roof ridge, or "backbone" of the Knox Presbyterian Church in Calgary. To compensate against "sagging" under its own tremendous weight it was fabricated with a special built-in camber. No further fabrication will be required once it reaches the building site—all necessary finishing and drilling have been completed at the plant.

Design details

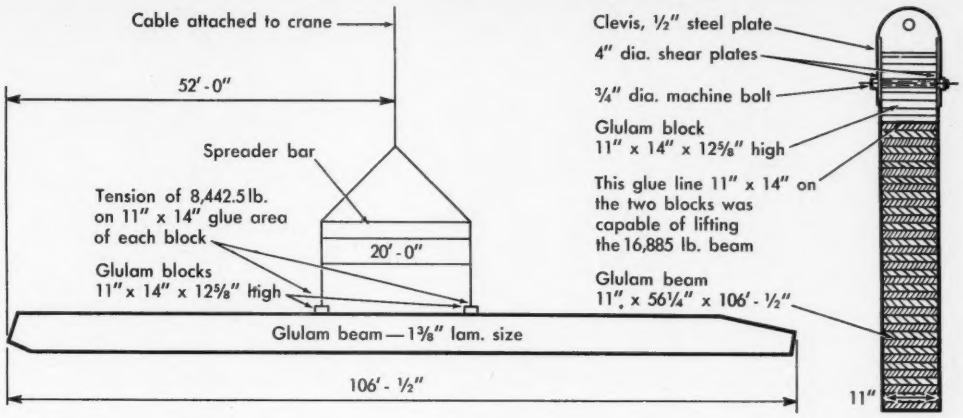
Forty laminations of Douglas fir were used in the production of the beam—9,649 bd ft of timber—sufficient to build one modern home. The whole operation including assembly, bonding, clamping, heat treatment, cooling, finishing and drilling took under 48 hours. The actual bonding or gluing took just two hours and involved a crew of 16 men. Over 700 lb of resorcinol waterproof glue were used, and temperature and humidity were carefully controlled during manufacture.

The enormous length of the man-made tree presented unusual transportation problems, and involved careful pre-planning. At the plant railroad spur, the beam was protected by a polyethylene envelope and wrapped in burlap, and lifted by a mobile crane onto a railroad car with one idler car on each end. Because the beam was too long to be carried by road through the railroad underpasses in Calgary, it was off-loaded at a spur on the side of the city in which the building will be situated. It was then loaded on a pole trailer, and trucked to the building site.

Laminated wood beams, columns and arches are being used increasingly in the construction of contemporary buildings. Their extreme versatility, combined with great strength, makes them ideally suited to the modern trend toward greater design freedom.

Commented Mr. Hall, general manager of Glulam Products on the completion of this beam: "With the development of the Qualification Code and the publication of the Timber Design Manual, the industry has in the past year made rapid progress, and jobs of this nature will now become commonplace rather than exceptional."

In the production of structural glued-laminated material the value of the glued member depends entirely upon the engineering of the product and the plant production methods used during its manufacture. The best engineered article may be worthless if the gluelines do not have the pre-assessed structural value. It is necessary that a qualified quality control department, working independent of production, inspect and scrutinize each of the major operations. This is but one of the many requisites in qualifying as a certified plant under the Canadian Timber Code.



The load carrying test provided visual proof that the glue-line strength is greater than the wood itself.

After the lumber has been chosen for the individual beam or arch it is transported to the scarfing machine where it receives a flat 1:12 slope scarf. This enables gluing the individual boards together end to end to achieve a continuous laminae for the entire length of the glued member.

The laminae is then transported into the gluing area where it is laid up in the jigs as either a straight member or an arch. A pressure of 110 psi minimum throughout the beam is then applied. It must remain under this pressure until final curing is achieved. If casein glue is used, such as for interior applications, elevated heat is not required as the glue sets up through moisture absorption into the wood. When the member is to be used under severe moisture conditions, such as over a swimming pool, ice arena or exterior, a waterproof glue is required. A modified resorcinol type of glue is used for this purpose which must be cured for several hours at an elevated temperature. Interior temperature readings are made and tabulated through the use of thermocouple wires imbedded in the centre portion of the glued member. Ordinarily a 90 F inner glueline temperature is maintained for eight hours to complete this cure.

Beam easily passed tests

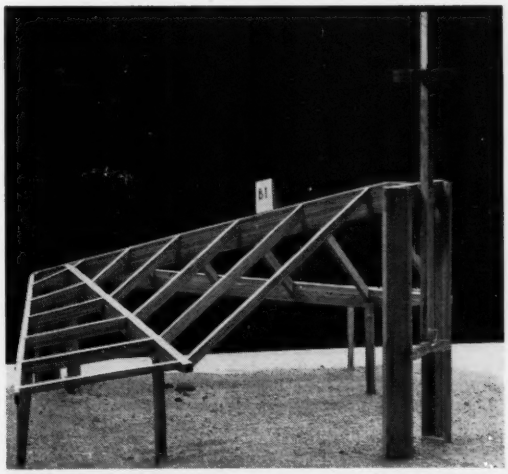
Upon curing it then passes through the planer, framing line and final finishing department. During each operation the lumber is properly scrutinized for defects which may develop in the wood itself.

This is a very brief resume of the methods used in laminating a beam. As indicated, this beam weighs over 8 tons. The engineering department has calculated that the glulam test blocks (see fig 2) which were attached to this beam (11 in. x 14 in. in area and 12⅝ in. high) will support this load. Actually all the glue-lines are valued at many thousands of pounds above this figure.

The load carrying test which was made actually was nothing more than a visual proof that glue-line strength is greater than wood itself.

The fire resistivity of glue-laminated material is well known; nature has endowed it with a characteristic which produces its own fire protection. If subject to flames, surface fibres char and expand which tends to insulate the sound wood adjacent to the surface. There have been many instances where beams have withstood a severe fire which destroyed the entire contents of a building as well as collapsed steel girders. After the fire the members have been scraped of the char and re-used for their original purpose. We are all acquainted with the natural warmth of wood and its fine texture may be further enhanced with stain or other treatments.

"We in the industry feel we have the wonder structural material of the century and there is no wonder that its popularity is growing throughout the world," said Mr. Hall. ★



Model of the structural framework of the church with the 106 ft beam on top.

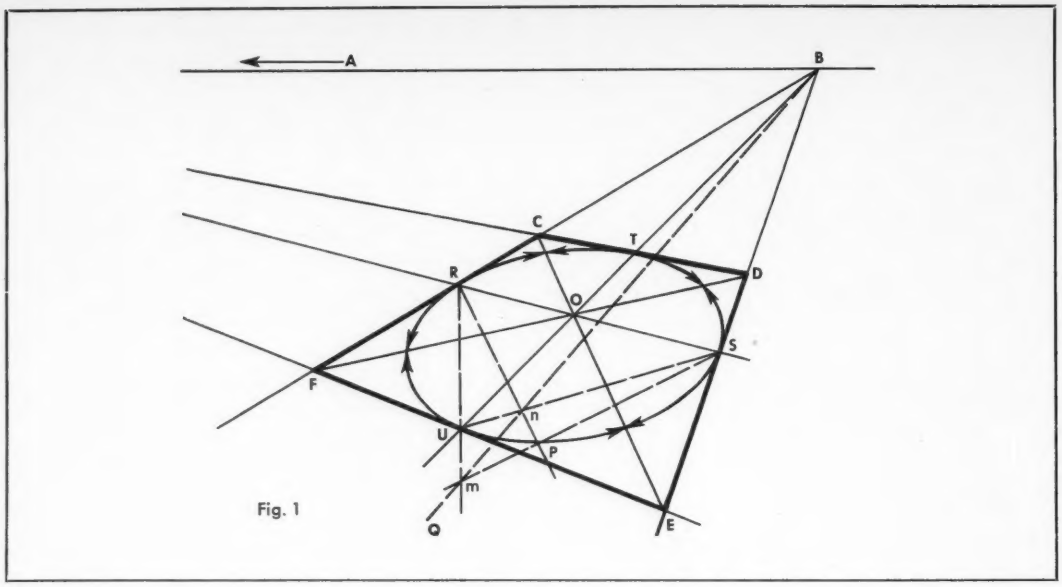


Fig. 1

Geometrical construction of circles in perspective

W. H. Sheppard, B.Sc.

It should, first of all, be realized that the perspective projection of a circle on any flat picture plane is a true ellipse, and that the centre of the ellipse is displaced from the projected centre of the circle which it represents. In technical illustrations, such ellipses are often sketched in by hand on the premise that there is no true geometric construction, when in fact, such constructions do exist.

After thorough investigation, the following constructions were evolved. The ellipse is considered with reference to a containing quadrilateral, which is the projection of the square containing the original circle.

In drawing items in perspective, a problem often encountered is that of constructing a circle in a square in projection. Although works on perspective have been published frequently since Greek times, usually only approximate solutions to this problem are given. The use of grids or treating the square in perspective as a parallelogram are the usual solutions.

This article gives an exact construction for determining the leading dimensions of the ellipse representing the projection required. To simplify the presentation, academic proofs are omitted and the constructions and explanations are simplified as much as possible.

Before attempting the construction outlined, it is recommended that you review the standard procedure for handling perspective drawing of squares and angles.

To plot the circumference

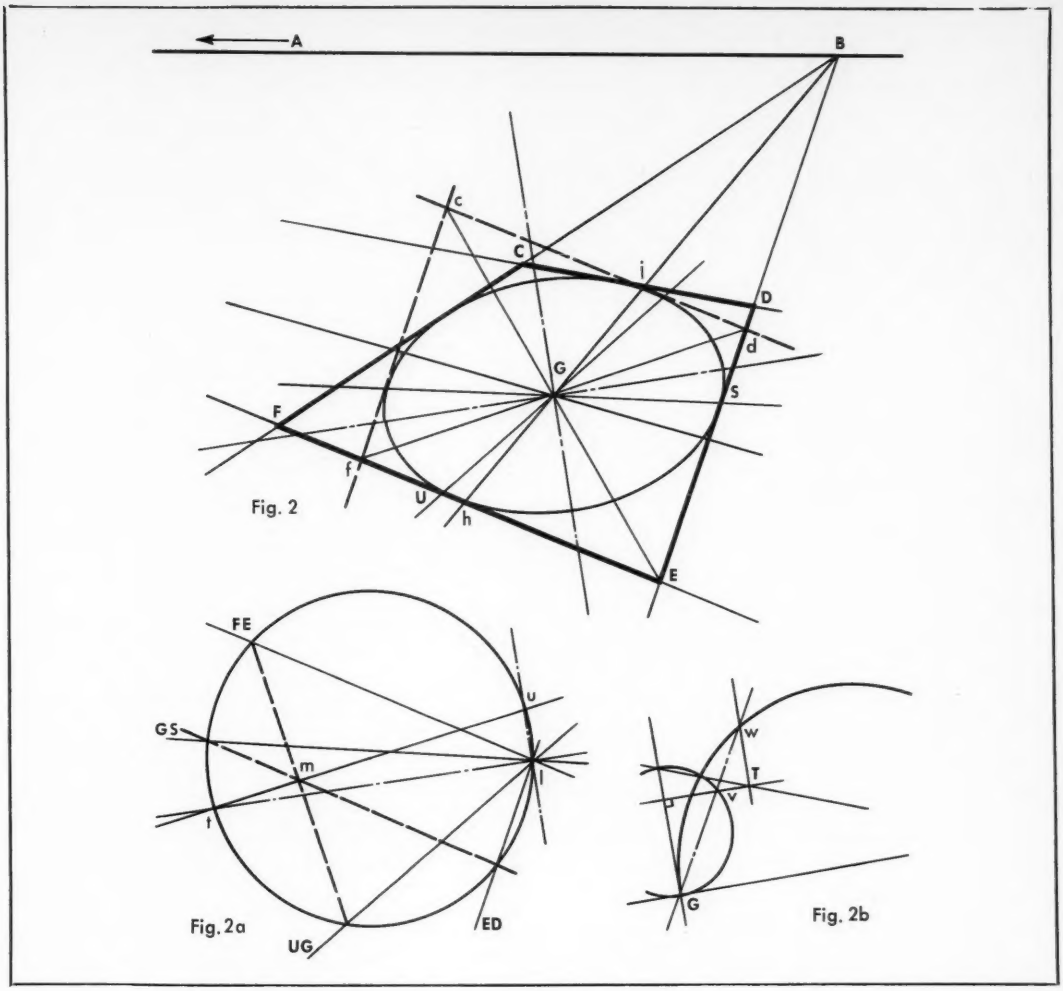
Let A and B be the vanishing points of the quadrilateral CDEF, with respect to the vanishing line AB. It is advantageous, but not essential, that the inscribed octagon be drawn, thus giving extra tangents to the circle. This may be done by normal projection or other method used to obtain the containing square.

Join CE and DF, giving the centre of the circle at their intersection point O.

Join AO and BO, giving the points of tangency of the square with the circle. Mark these R, S, T and U. If A or B is inaccessible, a centrolineade or geometric construction must be used.

Draw any arbitrary construction line BQ, with Q outside the projection of the square.

Draw construction lines Rm and Sn, then Rn and Sm, the latter intersecting at point P, which is a point on the required ellipse. By varying the direction and location of BQ and plotting varying points P, the whole circumference may be plotted. If A and B are both accessible, it is preferable to plot the ellipse quadrants in each direction from R, S, T and U, meeting on the diagonals CE and DF.



This form of construction is particularly suitable if only part of the circumference is required.

To determine leading dimensions

A. Centre (figure 2)

1. Bisect FE at h.
2. Join HB, intersecting CD at j.
3. Through j draw line parallel to EF.
4. Repeat construction with respect to DE, forming parallelogram Efcd.
5. Draw diagonals of parallelogram, intersecting at G, the centre of the required ellipse.

B. Direction of axes

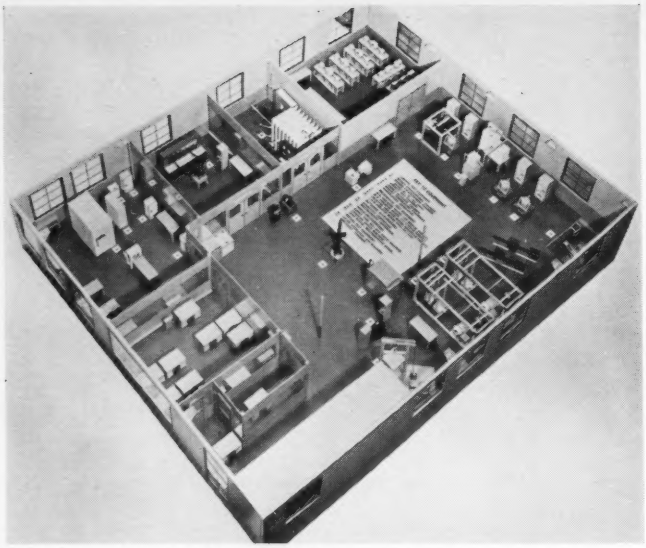
1. Obtain points S and U, as in the previous construction and join both to G.
2. Draw an auxiliary circle (fig. 2a) approximately equal in size to the quadrilateral CDEF.
3. Construct lines parallel to EF, ED, UG, and SG to meet on the circumference at l and join their other intersections with the circumference, determining the point m.
4. Draw diameter of circle through m, intersecting circumference at t and u.
5. Draw tl and ul. The major axis of the ellipse is parallel to tl and the minor axis is parallel to ul.

C. Lengths of axes

The lengths of the axes may be determined from any tangent, as indicated in figure 2b. Semicircles are drawn on the intercepts of the tangent with the axes, intersecting the perpendiculars from T at v and w. Gw and Gv are the lengths of the major and minor semi-axes respectively. If one intercept is inaccessible w may be obtained by producing Gv. On the other hand, it is preferable to obtain v from the location of w.

D. Circumference

The circumference of the ellipse may be drawn with an ellipsograph or templates, by mechanical construction or approximated by circular arcs. The simplest geometric construction is to draw the circles radii Gv and Gw and repeat the triangle vTw for a series of positions. The number of positions used will depend upon the degree of accuracy desired. If the focus F is required, this may be easily obtained by a perpendicular from the intersection of the tangent with the outer circle as shown. ★



Model of the Westinghouse environmental and appraisal laboratory showing arrangement of equipment.

Want to hire a test laboratory?

Avoid heavy capital investment and high maintenance costs

Environmental test chambers, which run the whole gamut of operational and climatic conditions, have become important tools in the development of machinery, instruments and materials for today's exacting requirements. In these modern "torture chambers" new products are subjected to punishing treatment and pushed to the limits of endurance under conditions rigidly controlled by highly skilled technicians.

From the intense sub-zero cold of high altitudes to the extreme heat or humidity of the tropics, from corroding salt water and fog to the all-pervading desert sand and dust, from the shattering impact of explosions to the wearing-down process of continuous vibration, there are few conditions which cannot be simulated within the four walls of a test laboratory.

Inadequate design, structural weakness, metal fatigue or other shortcomings would not, under normal conditions, become apparent until the new product had been placed in actual service long enough for valid conclusions to be drawn from its performance. Modern methods, reproducing accelerated environmental conditions within a test chamber, can accurately forecast the success or failure of a newly developed product in a much shorter space of time. The accelerated pace of testing minimizes interference with costly production lines and techniques.

Although the type of information available from controlled testing procedures has become a mandatory requirement of modern product development and manufacture, not every design or manufacturing organization can afford the heavy capital investment and the high operating expense involved in maintaining its own environmental testing facilities on a scale commensurate with present-day requirements.

Under such circumstances, the use of services offered by research organizations and industrial firms, who have made a specialty of this field, will be found to be both advantageous and economical. These services are available as needed without heavy capital investment or high maintenance cost.

CARL laboratory facilities

For instance, extensive facilities for this type of development work are housed in the laboratory of Canadian Applied Research Limited in Toronto.

Here, a wide variety of products ranging from building materials to the most advanced electronic or aircraft components are put through their paces under stringent security conditions.

Equipment produced by the company itself and tested in this environmental laboratory includes aircraft instruments and components which are in military use in Canada, the United States and other NATO countries. Primarily, however, these test facilities are offered as a service to governmental and industrial organizations to comply with both military and commercial specifications.

The highly specialized equipment includes horizontal and vertical mechanical vibrators, shock tester, electromagnetic shaker, icing wind tunnel, temperature-humidity and temperature-altitude chambers, radio interference room, high temperature oven, explosion proofing and fungus resistance chambers.

Canadair tests for the Arctic

Reproducing the exact conditions of the Arctic and sub-Arctic regions and giving the metal molecules of high precision instruments and gauges a rigorous workout is an important aspect of many evaluation tests carried out in Canada. Although a temperature of —65 F is usually considered the standard test for Arctic conditions, products frequently are tested at much lower temperatures. Refrigerants like "Freon-13" are credited with achieving temperatures as low as —130 F.

A typical testing unit of this kind has been used for some time by Canadair Limited, Montreal, one of Canada's leading aircraft manufacturers. Only a 4-ft cube internally, this environmental chamber does not differ greatly from a domestic refrigerator in outward appearance. Yet the outer wall consists of specially re-

inforced steel, half an inch thick, which covers an eight-inch thickness of insulation material. A force of approximately 80,000 lb can be exercised upon the door alone and the floor of the test space is designed to withstand a dead load of 500 lb.

Inside the chamber all electrical equipment is explosion proof. The multipane window consists of seven moistureproof layers of glass able to withstand any selected vacuum and a diffuser distributes air entering the chamber to ensure identical temperatures within any part of the rectangular test space.

The whole scale of temperature conditions, ranging from a high of +250 F to a low limit of —125 F, at pressures simulating given altitude conditions at specific humidities, can be achieved. The compressor and cooling system form a separate unit located in an adjoining room, while the control panel with its variety of instruments is placed next to the chamber.

With the help of this equipment it is possible to achieve within 10 minutes pressure altitudes of up to 100,000 ft, while only about 30 seconds are required to revert to conditions at sea level. Control valves to regulate "rate of climb" and "rate of dive", are attached to the test chamber. Humidities, too, can be maintained at pre-selected levels, ranging from a low of 20% to a high of 98%. The maximum relative humidity, combined with temperatures of up to 140 F, is employed to duplicate conditions commonly encountered in parts of the South Pacific.

In the low temperature range, Canadair has tested a wide variety of components under Arctic conditions. Put through their paces in this chamber were mechanical parts of the "Rat" snow tractor—one of Canada's contributions to the International Geophysical Year, and the intricate hydraulic system of the giant "Argus" CL 28, destined for long-range ocean reconnaissance duties with the RCAF. Certain missile components are subjected to even more rigorous workouts which stipulate —85 F at an altitude of 80,000 ft.



Large capacity temperature or immersion chamber, one of the test units used in the environment and qualification testing laboratory of Canadian Applied Research.



Temperature humidity chamber (left) and temperature altitude chamber (right) in the Canadian Applied Research Ltd. laboratory.

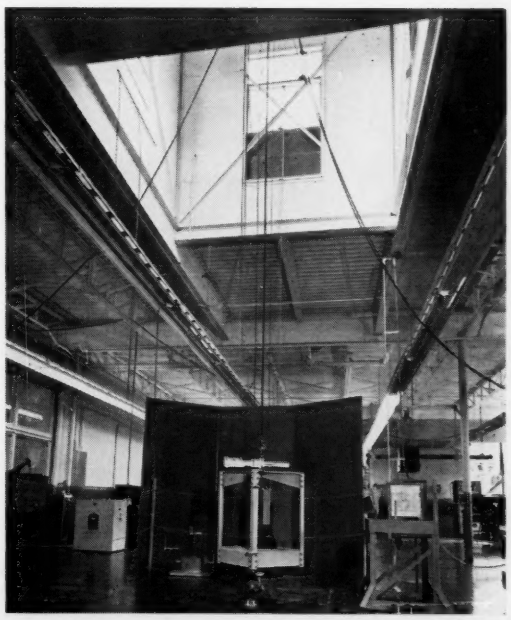
Facilities at Westinghouse

Canadian Westinghouse Company, in Hamilton, Ont., is another industrial company offering test facilities for general use. The equipment presently installed can be divided into three main categories, according to the types of tests for which they are primarily designed. These categories are climatic, mechanical, and hydraulic.

By using two or more types of equipment together, tests can be carried out under various environmental conditions applied simultaneously. Chambers for simulating stratospheric conditions of high and low temperature, humidity and altitude are featured. Mechanically and electrodynamically driven vibrators, sustained acceleration units, shock acceleration units, and hydraulic equipment for servo and other hydraulic and electro-hydraulic component testing are also available.

If your company is involved in engineering design projects which call for tests that cannot be applied in your own establishment, then you would be wise to investigate the facilities which are available in the many specialized test laboratories in Canada. The investment in these has been made on behalf of the whole of the country's industrial empire—to help further the work of the researcher and designer. To have them standing idle is to be losing valuable technological progress.

The three laboratories which have each been partially described in the foregoing paragraphs were selected only as typical examples of the many such establishments available across the Dominion. ★



Lead blocks of the type used with this Westinghouse shock acceleration unit are shown under and to the left of the mounting frame.

DE staff written

New duplicator a triumph of design art

Wide use of steel pressings gives strength, rigidity, compactness

One of the highlights to be seen at this year's Canadian National Business Show in Toronto is the Roneo 350 Duplicator. This small, compact duplicator caught your editor's eye primarily for that very reason—its eye-appeal.

But that was not all. A little checking revealed that a lot of engineering know-how and design had gone into the unit, with many innovations being incorporated into the machine.

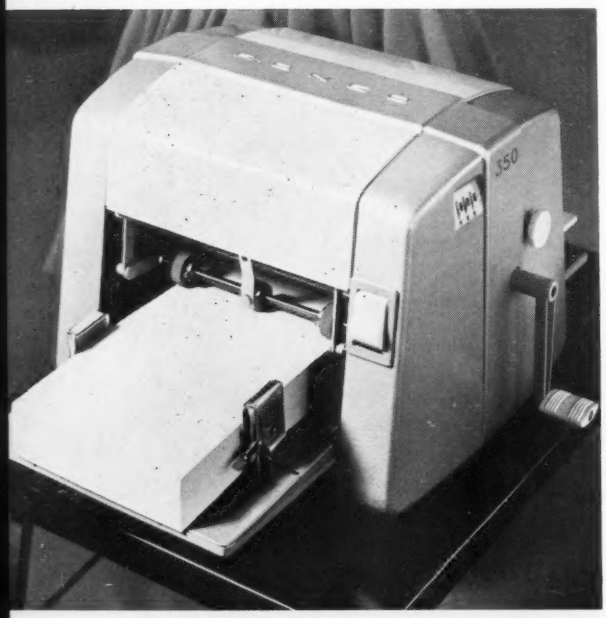
The rising feed tray accommodates 500 sheets of paper ranging from 3½ x 5 in. to 10 x 4 in.; postcards are fed with the shorter dimension at the leading edge.

A pre-set counter for up to 999 copies is fitted to cut out the feed when the required number of copies is duplicated.

Color changes can be effected very readily without fuss and without fear of inky fingers—in less than 30 sec—by lifting out the printing cylinder in use and substituting another cylinder containing ink of the color required.

The electrically operated model duplicates at a speed of 80 copies a minute, and on both hand and electrically operated models the first copy is usable and the last copy is cleared from the machine and ejected into the delivery tray. The electrically operated model is provided with an operating handle which may be pushed in to engage for hand operation when changing stencils.

When the machine is not in use, the feed and delivery trays fold up making an attractive, totally enclosed machine.



A great deal of engineering know-how and design went into the Roneo 350. The rising feed tray, seen here, accommodates 500 sheets.

Steel pressings used

The strength, rigidity, and compactness of the machine have been achieved by the extensive use of steel pressings which are ribbed or formed where necessary to provide adequate strength. All important bearings are fitted with oil impregnated self-lubricating bushes to give long life with the minimum of attention. Considerable consideration was in fact given in the design and development stages to the subject of servicing, and the construction of the machine is such that almost any component can be readily and cheaply replaced should this be necessary.

Paper is initially fed into the machine by a primary feed mechanism comprising two rubbered rollers located on a cross shaft. A conventional roller type clutch is included which locks the roller shaft on the forward stroke of the feed rollers and permits it to freewheel on the return stroke.

An important feature of the primary feed rollers is that they may be moved to suit the width of paper being fed. The rollers may therefore be located to run up and down at the edges of the paper, thereby ensuring that paper fluff does not accumulate on the duplicating area of the stencil and result in smudged patches on the duplicated copies. The primary feed rollers work in conjunction with a Trip Bar which feeds single sheets and also controls the feeding height of the paper stack.

Novel roller arrangement

Top and bottom secondary feed rollers are also fitted to ensure the accurate registration which is particularly necessary when duplicating multi-color work. The metal bottom secondary feed rollers, which oscillate backward and forward once per printing cylinder revolution, are fitted with a series of stop fingers against which the leading edge of the sheet of paper being fed is accurately located by the primary feed, and the top and bottom rollers when brought into contact by cam action feed the sheet further into the machine where it is gripped by the printing cylinder and a self-aligning impression roller.

As the duplicated copy is about to enter the delivery tray it contacts an adjustable ejector strip—another important feature — which bows the sheet as it is

stripped by metal fingers from the printing cylinder, causing a pocket of air to be trapped as the sheet flows into the delivery tray, thereby reducing the possibility of offset and ensuring good stacking.

The printing drum, which as stated earlier can be readily interchanged for color change, is in effect a hollow cylinder into which ink is manually squeezed from a tube as required. The printing area of the cylinder has numerous small circular perforations through which the ink is drawn into an attached ink pad and then through the stencil during the duplicating process.

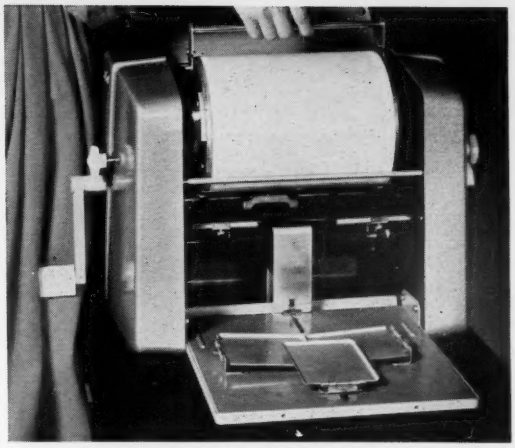
A consistent and even ink distribution is assured for all normal duplicating. If, however, a greater supply of ink is required, e.g. for electronic stencils or for exceptionally heavy printing, an inking roller contained in the cylinder can be made, by means of an external lever, to exert pressure against the inner face of the cylinder shell, thereby greatly increasing the ink flow.

Stencils are attached to the printing cylinder by three head hooks and by a tail clamp. The head hooks are retractable, therefore an inked stencil can be readily and cleanly removed from the cylinder by gripping the uninked stencil heading.

Electrically operated model

The electrically operated model is powered by a 1/30 hp motor coupled by a train of gears to the printing cylinder drive. A clutch which disconnects the main drive from the motor when the machine is manually operated is incorporated in the gear train, and a steel helical gear. Motors of various voltages and frequencies can be supplied.

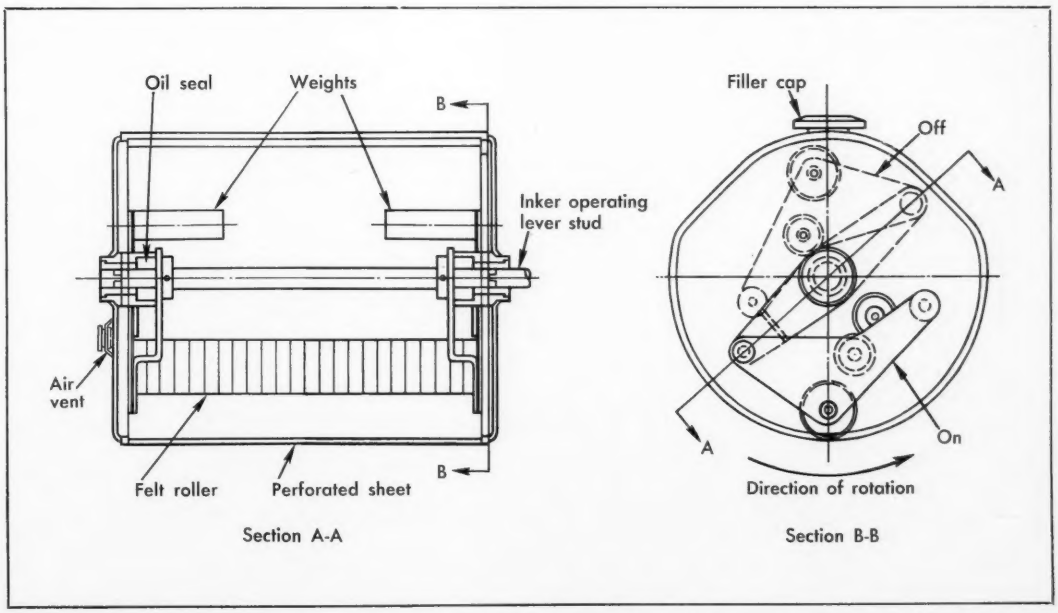
The position of the motor is of interest in that by housing it under the fixed top front cover of the machine and in front of the printing cylinder it was possible to keep the height of the machine to a minimum,



Cover is removed to show ejector strip and delivery arrangement. Note convenient handle for lifting ink drum.

and to design a symmetrical outline, thereby facilitating production in that a number of tools can be used for making both the left hand and right hand side frames and side covers. The motor cover has been so designed that in addition to covering the motor it, by virtue of its being secured to both side frames, plays an important part in the rigidity of the machine.

In the early design and development stages it was considered imperative that the machine should be capable of producing high quality work, both single and multi-color, at low cost, that it should be small, compact, robust and foolproof, requiring the minimum of servicing and, most important, clean to operate. All these requirements appear to have been met. ★



Inking mechanism of the new duplicator. Color changes can be made in 30 seconds by removing the cylinder and inserting another; no fuss, no inky fingers.

DE staff written

Explosives aid metal-working industries

One work-hardens steel, another forms metals to all kinds of shapes





METAL FORMING

The explosive charge is taped above the stainless steel blank (top). After the detonation the formed steel (bottom) is removed.

Research scientists in Canada's explosives industry have entered into what one recently described as "a period of active innovation."

A few months ago officials of Du Pont of Canada Ltd. demonstrated a new way of work-hardening irregular surfaces of manganese steel with a flexible sheet explosive. The demonstration showed how the new hardening method could be applied to railway track equipment, such as frogs, switches and crossings. Field tests indicate that the new process has marked advantages over those used in the past.

More recently Canadian Industries Ltd. scientists have demonstrated the extraordinary ability of explosives to form the hardest metal. C-I-L's research people believe that explosive metal-forming can duplicate most of the operations now performed with conventional drop hammers, hydraulic presses and other mechanical means.

Other techniques and developments may be expected. Both companies are actively conducting research in various fields. The new C-I-L research laboratory at McMasterville, Que., consisting of six buildings on the wooded grounds of the explosives plant, is as well equipped as any lab can be.

Varied Facilities

The test firing chamber is one of the largest of its kind. Adjoining it is the physics laboratory, and other facilities include a process lab, a magazine to simulate various conditions of storage, a process control laboratory, a large pioneering research lab for long-range studies and a spacious chemical engineering pilot lab.

Nitroglycerin is one hundred years old. Why the sudden research activity?

Dr. J. H. C. Dixon, research manager of C-I-L's explosives division, explains it this way. "Advances in scientific understanding of the basic mechanisms of detonation have widened the scope for new products, methods and techniques. The information we have about high explosives and blasting agents is being re-analyzed and reinterpreted by chemists, physicists and mathematicians."

Dr. Dixon believes that experiments still being conducted with the new metal-forming process will enable C-I-L researchers to calculate the exact conditions for forming a wide variety of metals. Very little detailed information on the fundamental aspects of metal-forming has been published.

How it started

The process was developed from information published by naval scientists in the United States. They had studied the effects of explosions from mines and torpedoes, and noticed that the hulls of ships nearby were abnormally deformed without being ruptured.

Some metal forming has been accomplished in a gaseous medium, but usually the work is done with blanks, dies and explosive charge under water. In free forming the parts are formed with open-ended dies; closed die forming requires a machined die sealed off from the water.

Why doesn't the material rupture under the force of the explosion? A C-I-L man explains jocularly, "It all happens so fast that the molecules haven't a chance to jump out of the way."

The Du Pont process for hardening steel is particularly useful for manganese steel, which cannot be effectively hardened by such conventional methods as heat-treating and tempering. But managanese steel is "work-hardenable," which means that its surface can be hardened by pressing, rolling or hammering. Thus a manganese steel

part can be hardened on the job when normal operations subject it to similar forces.

Hardening the metal in use possesses the disadvantage that parts tend to wear rapidly and become severely deformed during the early stages. However, the flexible sheet explosive method can harden castings of almost any shape without wear and with controlled deformation. The hardening effect can also be concentrated on specific wear areas and imparted deeper into the metal. The surface hardness, yield and tensile strength of this tough alloy can be doubled.

Basic Ingredients

The sheet explosive is basically PETN (pentaerythritol tetranitrate), but also contains ingredients to make it pliable. It looks like ordinary linoleum, is easy to cut and will conform to almost any shape, but, like any other explosive, it must be handled with care and by trained personnel.

To use the process, the sheet explosive is cut to shape and size with a paper pattern and a knife. The metal surface is cleaned with acetone and other cleaning solutions and allowed to dry thoroughly. The shaped explosive is then cemented flat against the surface to be hardened and next the prescribed type of blasting cap is attached to the explosive with masking tape and detonated by an electric blasting machine.

Firing is usually done in the open, but can also be done under water to muffle the report. As the sheet is detonated, a shock wave flashes across it, exerting pressures up to two million pounds per square inch on the steel. Molecules within the casting are slammed hard by the great force, which sets up strain lines within them. These deformation lines interlock some of the atoms, preventing movement along "slip planes" and thus hardening the metal.

The degree and depth of hardness are determined by the shape, thickness and placement of the sheet explosive. The value of explosive hardening shows up in added wear life and decreased maintenance. Some railway track parts so treated have lasted several times longer than untreated parts allowed to harden in use. Replacements and emergency shutdowns have been reduced.

Besides being applied to railway track equipment such as frogs, switches and crossings, the process can double the surface hardness of stone crushers, power shovel buckets, dipper teeth, crawler pads and other products subject to high impact loads and abrasions.







WORK HARDENING

Top: A steel railway frog is prepared for explosive hardening while engineering and track officials look on. First the surface is cleaned.

Above: The explosive sheet is cut to shape with a knife (shears are dangerous) from a paper pattern of the area which is to be hardened.

Above right: The explosive is placed on the frog and smoothed flat. The blasting cap is detonated by electricity a safe distance from the operation.

Right: A puff of smoke and flame signals the final phase of the process.





Part of the new Design Centre in the National Gallery of Canada. The exhibition is itself good design. The easy flow, floating displays and flexible lighting are excellent. The author points out one tiny defect, the lights are too low, and warns tall visitors that they are also very hot.

Canadian design in retrospect 1949-59

by Frank Davies

member of the National Industrial Design Council's Design of Merit Awards jury (and also editorial art director of Design Engineering)

Industrial designers in Canada have gained much from the formation of the National Industrial Design Council. The profession has gradually been accepted by industry, partly through its own efforts and also because of the NIDC awards, the Design Index and the many exhibitions at the Design Centre in Ottawa.

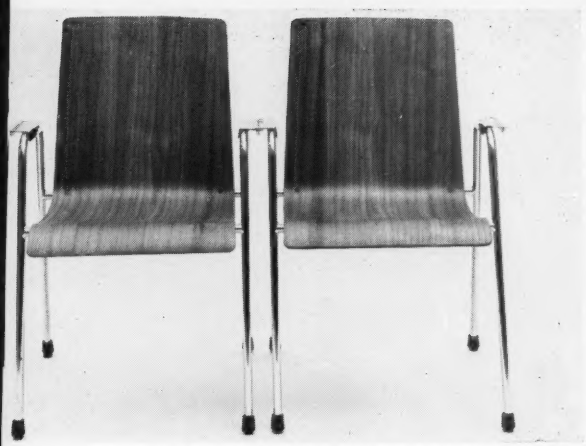
The latest of these exhibitions, "Canadian Design in Retrospect 1949-59," lets us see this growth objectively. It appears that today we have a group of highly competent industrial designers, serving Canadian industry far better than industry serves them.

Among the exhibits are a few which would meet the loftiest of international standards. All are sound, practical, efficient, economical — and good business.

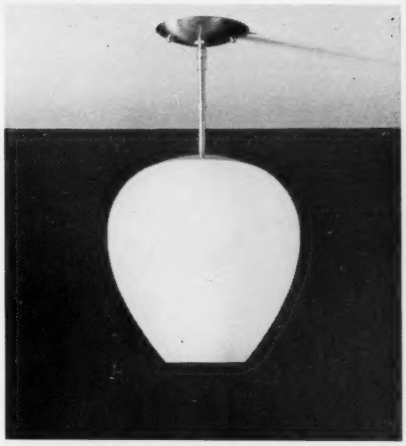
The Design Centre in its new program is emphasizing Canadian design for exports. Every designer should give it full support; the NIDC is working consistently and well on his behalf.



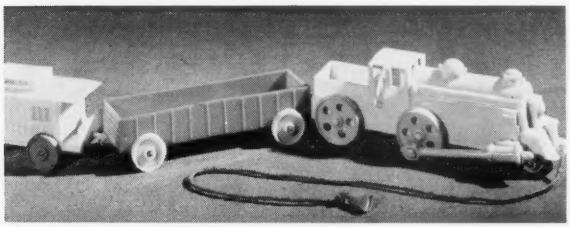
This line-up of well-designed Canadian chairs includes the famed Guillon (fourth from left) made of laminated wood and taut nylon cord and the elegant Court Noxon steel frame side chair (sixth from left).

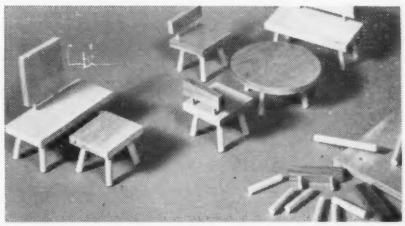


An unusually good solution for mass seating is this interlocking, stacking chair of laminated walnut and steel tubing, designed by Sloan and Wolfenden for J. & J. Brook. It is light, robust and economical.



The "Snifter" light by Gottlieb for Modulite is of matte white blown glass. To the right is part of an illuminated ceiling panel of light stabilized white polystyrene, designed by McCormack for J. A. Wilson.

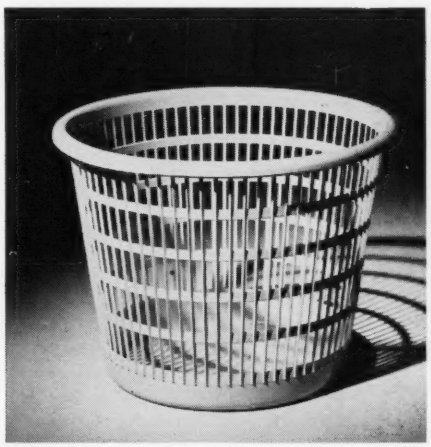




Rugged toys are among our better products. Here are a durable, colorful polythene train by Reliable Toy and lacquered birch furniture assembly top by Maba Toys, both highly finished.

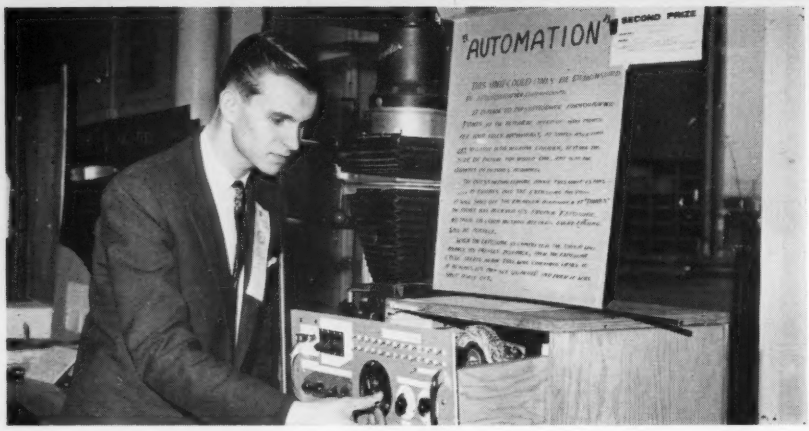


Rowan's electric kettle for Filtro combines many good design features. The handle protects the fingers and balances the filled kettle well; the spout has a steam guard which lifts for filling; there is an automatic shut-off and the plug is clear of the table surface.





Jim Warren's polyethylene laundry basket for Smith & Stone is still of the best in its field. It's light, snag-proof, washable, has a solid waterproof base, well ventilated sides with strong open ribs; the continuous peripheral handle is strong and convenient. To the right is a Herbert Yates fabric design called Bus Stop.



Dietmar Florian, of Oshawa, Ont., an engineer of tomorrow, demonstrates his automatic photoprinter at the Ontario Science Fair. He won second prize in the engineering section.

Embryonic engineers show their mettle

And a teenage girl exhibits more confidence than her male confreres

A fuel cell, a thermal electrolytic unit and a machine for high-speed production of photographic prints—these won prizes for five young Ontario students in the engineering division of a science fair held in Toronto recently.

But more than winning them prizes, the exhibits may have signpointed the way to future careers in engineering, though none of the five teenagers was absolutely sure yet where he was headed.

The two who devised the model of a fuel cell ("the fuel of the future") thought they might just go in for chemistry.

The two who built the model of a thermal electrolytic unit were a trifle more certain. One was sure he would study mechanical and chemical engineering. The other was attracted to pure science.

The student who invented the automatic photographic developer (no model this, but a real operating unit) said he wanted to major in mathematics and physics and then build "photographic projects."

But one who was rather more certain than these winners of the first three prizes was the student who won the first honorable mention. She is positive she will take engineering and has two years to decide what branch.

Modest Girl Designer

Marilyn Hogg of Woodbridge High School, daughter of Allan D. Hogg, B.E., M.A.Sc., Ph.D., of the Hydro-Electric Power Commission of Ontario, was the only girl to win recognition in any of the "masculine" divisions of the Ontario Science Fair, which was staged at Exhibition Park, Toronto, in April. Her exhibit was a model demonstrating the principles of magnetohydrodynamics.

Is she proud of her success? "Not really. I don't think much of my exhibit. I would much rather have produced that one," and Marilyn indicated the photographic unit which won joint second prize for Dietmar Florian of Oshawa Missionary College.

Does her father give her any encouragement to study engineering? "Well, he tells me what I want to know, but it's difficult to get information out of him."

What does her father do at Ontario Hydro? "I don't know. He never says much about it." (Actually Dr. Hogg is supervising engineer, applied mechanics section, structural research department.)

Has she any brothers and are they interested in engineering. "Four, and they're not. They're more interested in cooking, which I loathe."

Meanwhile at the exhibit next door Dietmar was busy explaining to a small but fascinated group how his photographic device works, but said he could not demonstrate it because it needs total darkness.

A large sign on Dietmar's exhibit said it was "a unit to mass-produce photoprints at the remarkebe (sic) speed of 3,600 prints per hour . . . and shuts off the enlarger bulb when it 'thinks' the print has recieved (sic) its proper exposure."

The two students who tied with Dietmar for second prize were Les McLean and Steve Smith of Grantham High School, designers of the thermal electrolytic unit.

First prize went to Kenneth Passmore and Derry Bibby of East Elgin High School for their model of a fuel cell.

This was the first science fair for students across Ontario though city-wide fairs have been held in Toronto, Winnipeg and Vancouver. The Ontario Fair was sponsored by the Rotary Club of Swansea (Toronto) and the Toronto Telegram. Support for the fair came from the Association of Professional Engineers of Ontario, the Ontario Research Foundation, the Chemical Institute of Canada and several industrial organizations and educational groups.

The sponsors hope to encourage the development of scientific aptitude in Ontario secondary schools. For this year's fair they organized 11 categories, including engineering, metallurgy, chemistry, nuclear science, electronics and general physics. The first prize in each category was $200 cash or $400 scholarship, second prize $100 and third prize $50.

Engineering Entries Lead

The top winner was Gary Botting of Peterborough Collegiate, whose classification was zoology and whose exhibit was the Cynthia moth. He won an all-expense trip to the National Science Fair in Indianapolis, Ind., for himself and a teacher of his choice. One judge said Gary's entry would easily merit him an M.A. degree.

Federico Strasser

Universal bending dies simplified

Sixteen types illustrated and described here for your guidance

The most frequently used angle in mechanical constructions is without doubt the right angle, or 90 degree angle. Consequently, one of the first dies made or purchased by any metal-working shop is the right angle bending die, or "vee" die, as it is more commonly known.

Of course, it would be desirable to employ the one die for all 90 degree bends—that is, to have a universal die. Engineers soon realize unfortunately, that there is no such thing as a fully universal vee die. In fact, the die opening in the female stamp of a right angle die must always bear a certain relation to the size (thickness) of stock being worked. Best results are obtained when the die opening corresponds to approximately eight times the stock thickness. Therefore, a given bending die can be employed only for one value (or a small range of values) of stock thickness.

Such a tool may readily be utilized as a partial universal tool, because within the stock range, it can be used for practically an infinite variety of differently shaped workpieces. In fact, changing the work-positioning nest (in the case of die-cut blanks, fig 2) or the stops (in the case of cut-off pieces, fig 3) the same tool may be used for any variety of stampings. The stops in question may be adjusted to any distance from the bending zone and at any angle to the bending line.

Classification of dies

If, in addition to the blank shape and/or length being variable, the stock thickness also varies, then it is absolutely necessary to resort to universal bending dies — or have a different die for every variable. Three solutions are possible, looking only at the female stamp part. These are:

1. A solid block with several vee canals.
2. Sectional construction with differently shaped die blocks.
3. Adjustable female dies.

Solid blocks

Figure 4 shows an example of a steel block where a series of suitable vee's have been machined. With a number of such blocks a wide range of stock sizes can be handled.

With this tool, as with all the tools described in this report, the type of adjustable stop shown in fig 2, or any other type of adjustable stop, may be employed.

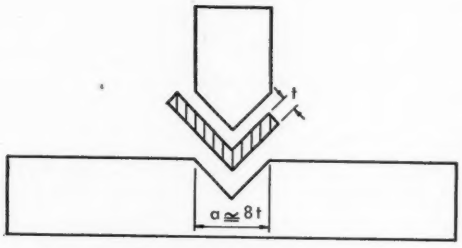


Figure 1

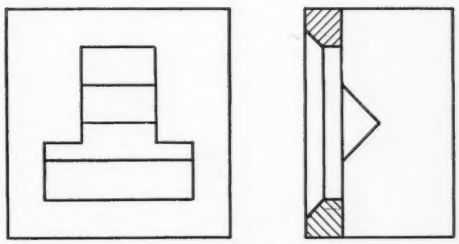


Figure 2

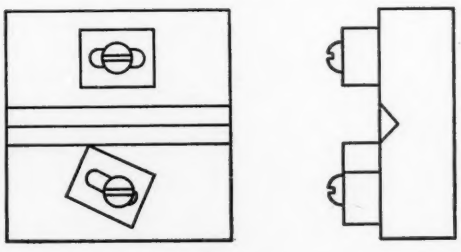


Figure 3

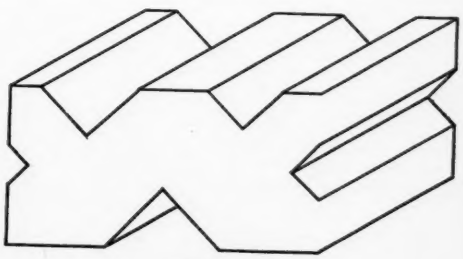


Figure 4

continued ▶

Bending dies *Continued*

Sectional construction

The simplest design of universal bending die consists of a die holder (made from cold-rolled steel) with a screw arrangement holding together two suitably shaped tool steel blocks (fig 5).

Changing the position of the blocks permits four different die opening sizes, and thus the tool may be used for four different stock sizes.

Substituting other shapes or sizes of blocks will provide dies for any varieties of stock sizes.

The tool must, of course, be provided with some form of adjustable stop, but these have not been shown in the drawings.

Adjustable female dies

Since in the bending operation, the formed stamping normally follows the shape of the punch (male stamp) the female portion of the die need not necessarily follow the exact contour of the finished product. It must, however, approximate the shape enough to control the operation. So, simple adjustable female dies are often used, where the die opening is regulated by adding or removing spacers (fig 8, 9) or by adjusting the space between the two end blocks.

No right angle bending

Quite logically, all the types of universal bending dies, as specified above for 90 degree bends, may be adapted also for any other angle value.

In addition, certain gimmicks may be used which allow the application of a given bending tool for the forming of bends with greater angle values than the shape for which the given die was originally designed.

For instance, by the simple expedient of limiting the press stroke (fig 10) the bent angle is always greater than if the tool were completely closed down.

Channel bending

Where double right angle bending is required, in addition to the stock thickness, there is another important factor, namely the dimension "a", if the distance between the two parallel legs (fig 11). Consequently, universal bending dies for this application must change not only the female die but also the forming punch width. Both details may be done by actual change of parts or adjustment.

One may use solid steel blocks in which different sizes of die openings have been machined (fig 12) or employ block-sections which create different die openings according to their arrangements (fig 13, 14).

U-bending dies may also be adjusted by means of spacers (fig 8) or by interposing separating blocks of different width (fig 15) or by means of tapered surfaces (fig 9).

An adjustable punch design is illustrated in fig 16. By moving one of the two steel blocks (the other having a fixed position), the distance "b" between the parallel surfaces is changed. ★

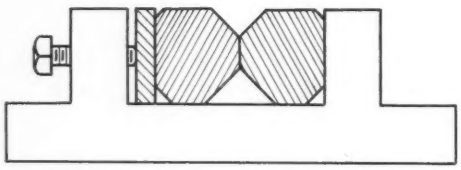


Figure 5

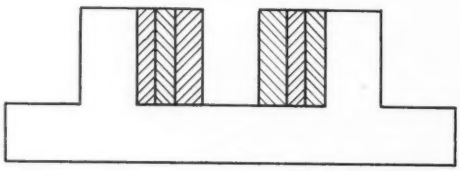


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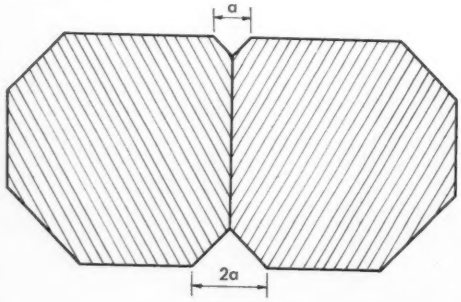


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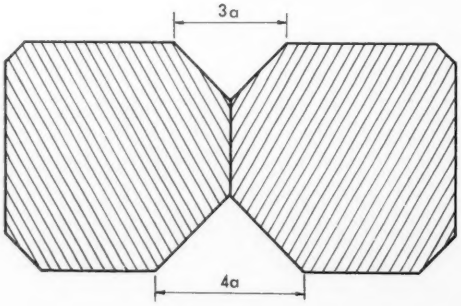
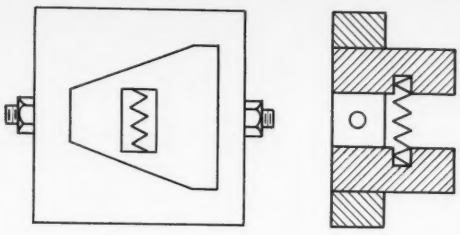


Figure 7



Figue 9

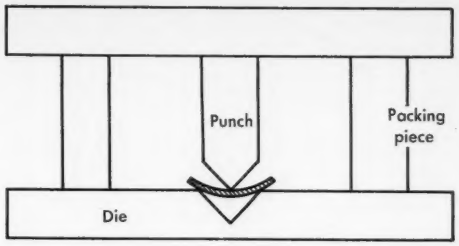


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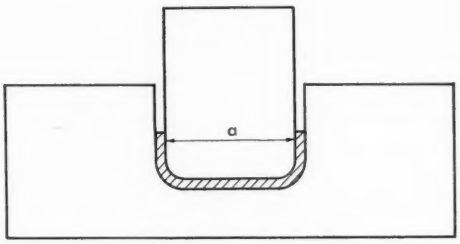


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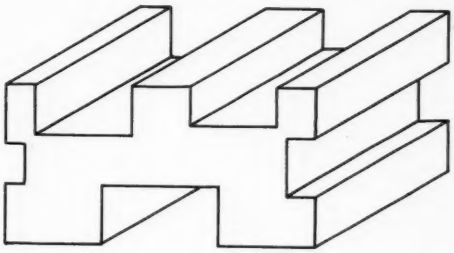


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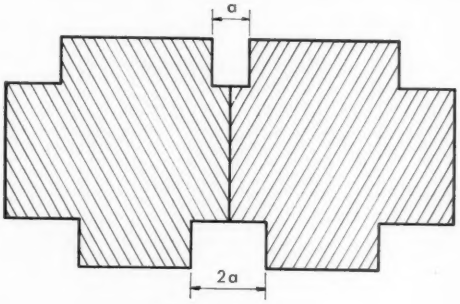


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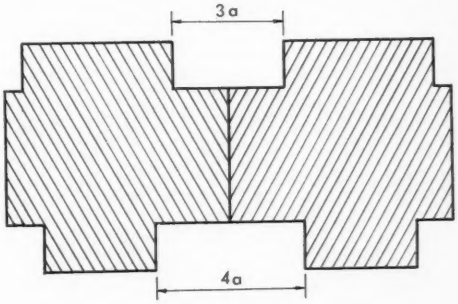


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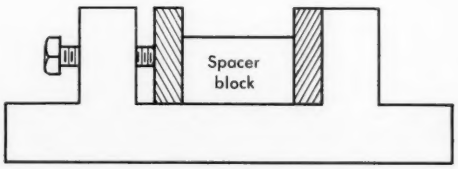


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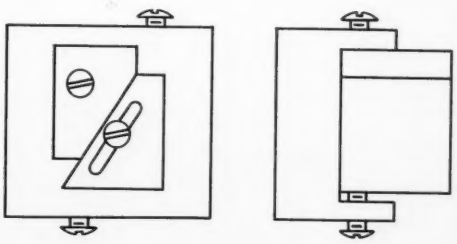
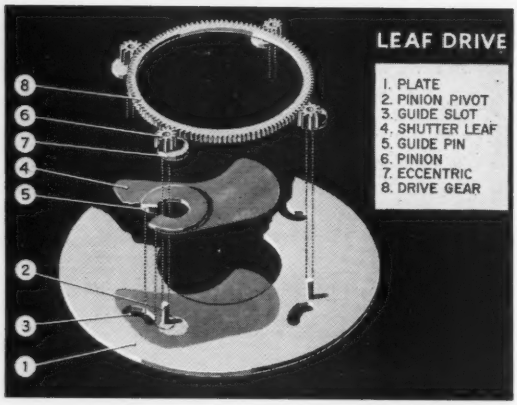


Figure 16

New concept in high-speed shutters

Between-the-lens camera device said superior to focal plane shutter



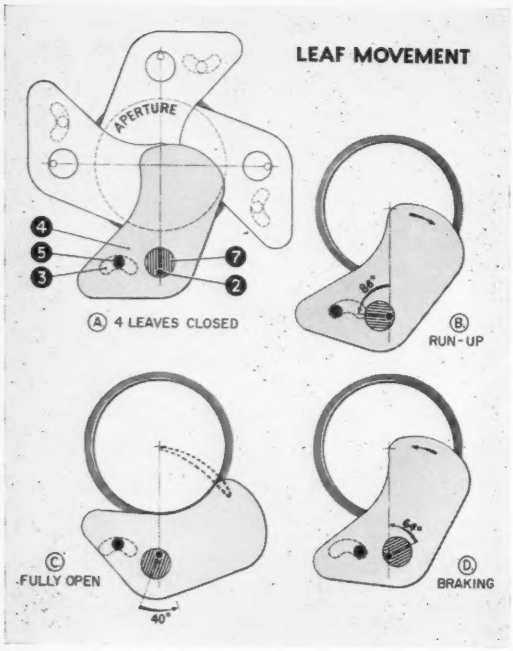


Fig. 1 (leaf drive) is an exploded view of the heart of the shutter mechanism. The shutter employs four leaves each driven by its own pinion and eccentric. The movement of the shutter leaf (4) is controlled by the action of the eccentric (7) and guide pin (5) in the curved guide slot.

Fig. 2 (leaf movement) is a schematic drawing showing a complete opening and closing in four stages: the leaf in the closed position; the "run-up" phase; the leaf fully clear of the aperture; and the aperture fully closed.

The advent of a new camera last fall brought to the photographic world the fastest, between-the-lens shutter ever developed. The shutter, which has taken a decade to engineer and produce, has a top speed of 1/1000th of a second at its full one-inch aperture.

Previously, photographers had to rely upon a focal plane shutter for rapid action photography. The introduction of the Graflex 1000 between-the-lens shutter permits high speed pictures with complete uniformity of exposure and without the limitations normally associated with focal plane shutters.

The new shutter offers features designed to make the everyday business of taking pictures at slow, mid-range, and high speeds a great deal easier. For instance, the shutter automatically provides optimum synchronization at all speeds through 1/750th of a second for M-type flash bulbs, and at all speeds through 1/1000th of a second for Stroboflash, and other electronic flash units.

Another innovation is that of the press focus lever which opens and closes both shutter and diaphragm leaves in one operation with the shutter in either the cocked or released position without disturbing prior diaphragm or shutter settings. The location of the diaphragm control lever greatly reduces the danger of accidentally changing the diaphragm opening while making shutter adjustments. All controls are man-sized and easily accessible for operation under the most trying conditions, such as during cold weather or night operation. The shutter is cocked by means of turning the non-reciprocating, integral lens shade-filter holder instead of by the reciprocating cocking lever usually protruding from the rim of shutter.

The shutter achieves its operational efficiency by opening and closing its leaves, at any given speed, faster than any other shutter. Briefly, to develop a high-speed shutter, the designer must devise a mechanism which rapidly accelerates and gently brings to a stop the shutter leaves and associated components. This calls for more precise design and machining than is found in most fine watch movements. It also demands structural strength to withstand thousands of operations without failure. The faster the speeds at which a shutter is designed to operate, the more rugged must be its components.

The new shutter utilizes a totally new concept of shutter operation. Each of four shutter leaves is separately mounted and guided by an eccentric and a stud operating in a slot. The resulting blade motion is elliptical, thus the blades are not called upon to stop abruptly and reverse direction during the exposure. This elliptical movement allows the shutter blades to open, and, following the controlled open time, to close, yet continue to move in a final gentle braking action, thereby minimizing shutter vibration and subsequent damage to components. The elimination of shock, vibration and shutter bounce means prolonged shutter life and less maintenance. ★



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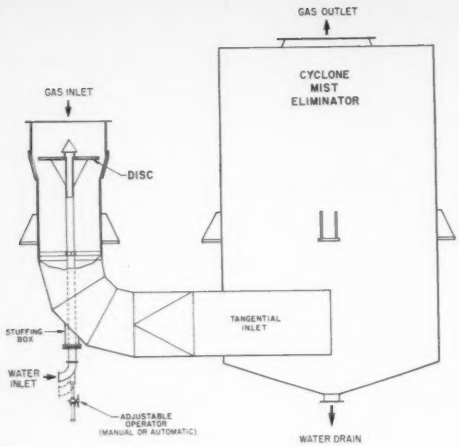
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Unique scrubber reduces cost of effluent treatment

Designed for collecting fumes in steel furnaces and chemical processes

A new type of scrubber employing a unique adjustable flooded disc has been developed for high efficiency gas fume cleaning. Present designs of the new flooded-disc scrubber are specifically adapted to collecting submicron fumes such as occur in steel-making furnaces and chemical processes.

Major feature of the unusual new scrubber is its ability to adjust for maximum cleaning efficiency over a complete range of operating conditions. At gas flows 50 percent higher or lower than normal, water rates and pressure drop remain the same while gas cleaning efficiency is maintained at a high level.

By recirculating dirty water without impairing efficiency, the flooded disc scrubber also makes it possible to use smaller and more economical effluent treatment systems. Low-pressure plant water cannot clog large-area water passages used throughout this compact and rugged scrubber.

Completely automatic operation of the new flooded disc scrubber has also been developed by the design engineers to provide continuous automatic adjustment over an entire range of plant operating conditions. Design of the new system adapts itself to wide plant variation rather than a specific set of rated conditions.

Designed for modern high gas pressures, the basic principle of the flooded disc scrubber is a turbulent flow of a gas-liquid mixture that provides an intimate and violent contact between dust and liquid particles. Water or other scrubbing liquid enters through the stem of the disc support and is injected into the gas duct at the centre of the disc. The water is deflected to the rim of the disc where it mixes with incoming gas in the annular space between duct and disc. Here the water breaks up into millions of extremely fine particles which collide with and adhere to the dust fume.

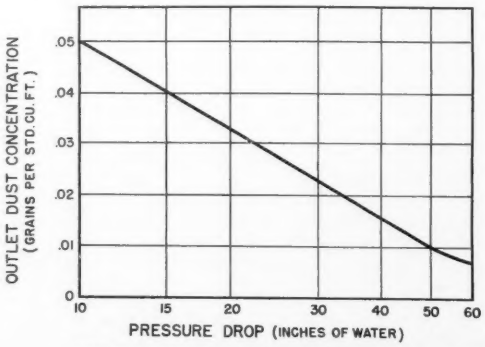
Repeated collisions of the fume-water mixture agglomerate and enlarge the particles. These particles quickly become large enough for separation and collection in a cyclonic mist eliminator which follows the scrubber.

Conical reduction of the gas duct at the disc makes it possible to vary the annular space considerably by raising or lowering the disc a short distance. As the disc moves up within its cone-shaped casing, the annular space becomes larger and more gas can be handled. Moving the disc downward compensates for a reduction in gas flow. Rates of gas flow from open hearth, oxygen converter and blast furnaces may vary considerably during operation.

Pressure drop through the flooded disc scrubber can be kept constant at all gas flows from 50% to 150% of rated conditions. Consequently, gas cleaning efficiency will remain the same at all flow conditions. At high gas flows blowing system equipment is not burdened with an extra power load at the wrong time. During a 20-minute cycle for an oxygen converter, for example, where gas flow changes over a wide range, the flooded-disc scrubber can maintain constant pressure drop through the whole cycle. Water rates can be increased, not decreased, to take care of increased gas flow.

Large water passages in the new scrubber make it possible to operate effectively with very dirty water. With no restrictions or nozzles to plug up, maintenance and replacement downtime are negligible on the flooded disc system. Water can be constantly recirculated through the system and the effluent volume reduced sharply. This makes it possible to reduce the size and cost of effluent treatment equipment.

The flooded disc design eliminates long converging and diverging flues. Compact and easy to operate, the new scrubber takes up a minimum of plant space. Areas subject to natural abrasion are limited to the disc and cone, and only small amounts of abrasion-resistant materials are needed. With automatic adjustment controls the flooded disc yields continuous optimum performance without the attention of plant personnel. ★



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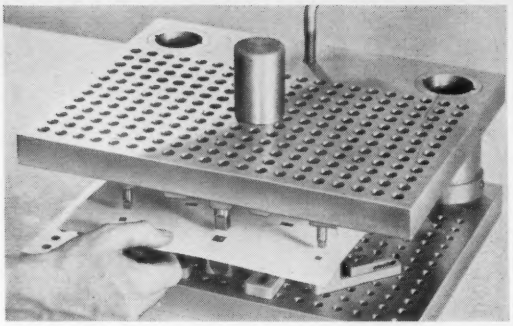
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Ideas round-up

One punch punches a myriad holes

Someone has come up with an adjustable punch and die program which allows you to punch a number of holes of varying size and shape in one operation and to keep using the tooling over and over again. The basic elements in this program are specially designed die sets on which punch and die holders can be arranged, by means of a template, into a variety of hole patterns.

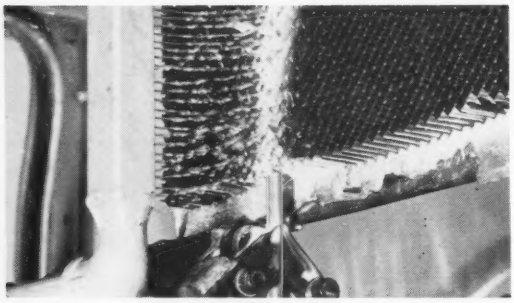
The program can be used for both long and short runs, but has its best application where multiple holes are to be punched on a short-run basis because it saves the time and money involved in punching or drilling holes individually or having a permanent die made up.



Material as thick as 16-gauge mild steel and ⅛-inch aluminum can be punched to tolerance of plus or minus .0005 inch.

Circle 300 on Reader Service Card

Band sawing technique for metal foil



A new electrical machining process has been developed for fragile cellular structures of metal foil or thin-wall tubing. Known as quenched arc cutting, the process is an extension of the band sawing technique, the work being sliced away by a band that removes only 1/32 in. of waste material.

The cutting rate is comparatively high (5 to 50 sq in./min) for finely finished work and very high (150 to 200 sq in./min) where the finish of the foil edge is not important. As hand feeding is impractical the machine is equipped with a power feed table designed for precise feed adjustment to the rate required by the geometry of the workpiece and the voltage applied.

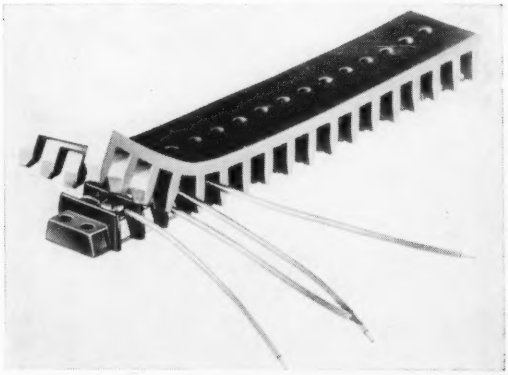
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Terminal block covers reduce fire hazard

Here's a safety innovation for the electrical and electronic markets. Whenever terminal blocks are used, there is an inherent danger of fires and short circuits and the disruption of electrical equipment. More effective than the metal covers, plastic lids or other hard-to-remove protection which is sometimes utilized in these hazardous areas is a new rubber cover in Neoprene, Buna-N or silicate rubber.

The cover is produced in three basic forms. One type is a flexible casing constructed with a wall between each terminal pole. The outer wall is slit to allow wires to be easily guided through the wall to the terminals. The plugged edge of the terminal block fits into the receiving holes of the cover, securing it in position.

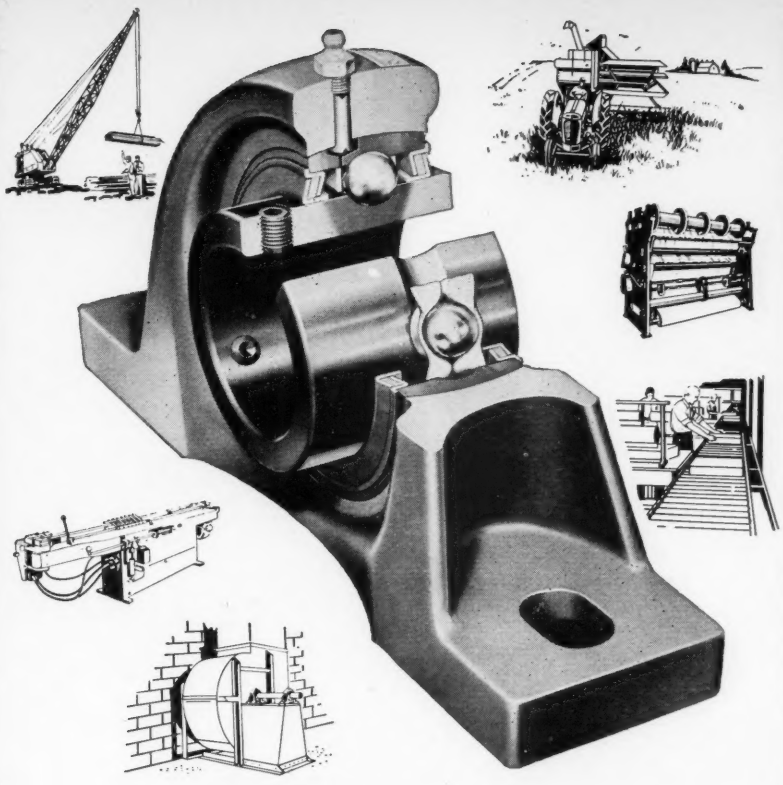
Another type is designed for barrier strips, as illustrated. The cover fits firmly and quickly into place because the divider between each terminal is grooved to receive the terminal wall. The third type is a thimble-type terminal cap for use where the larger unit is impractical. It is designed to fit over an individual terminal



pole, the opening at each end being molded into a curved, protruding shield.

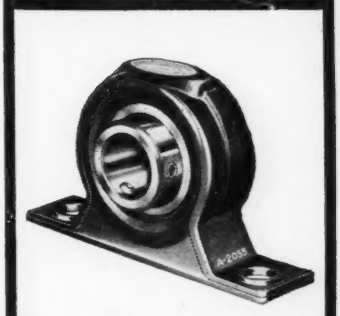
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(Continued on page 74)





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The new SEALMASTER "L" Series provides a precision, low-cost line of self-aligning ball bearing units. They are permanently sealed and pre-lubricated with a high grade lubricant for long life.

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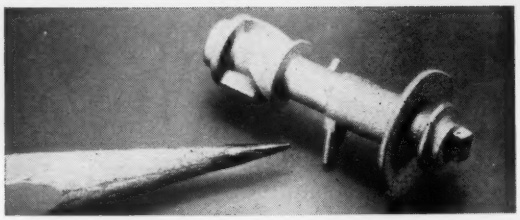
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Ideas round-up — *continued*

Tiny casting clicks camera



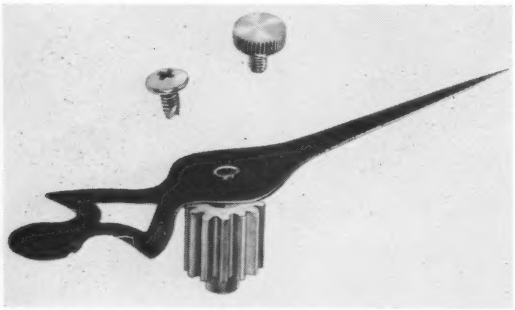
Minicast — a precision forming process that can save you money if your product contains tiny machined parts. Latest example is a power shaft that controls the shutter speed and timing mechanism on a 35 mm camera.

The part was formerly made on an automatic screw machine with extensive milling and other secondary operations required. Now it is cast in chrome-nickel-moly steel at less than one third the original cost. This cost saving was partially realized because the casting process was able to hold, as a primary operation, tolerances ranging from plus or minus .002 to .005 maximum. This is particularly important in the difficult-to-machine cam areas. The only secondary operations required in the new method are simple drilling and teeth shaving operations. Source — *Casting Engineers Inc.*

Circle 303 on Reader Service Card

Fasten on to savings

If your pet design proves costly when it goes into production take a close look at details. It may be that you are throwing money away on fastenings. Why produce a design that calls for specially made fastenings when a slight redesign can take advantage of stock fastenings? Here's a case in point:



A prominent company were manufacturing a kitchen scale. Assembly of the dial needle called for the needle to be fastened to a brass pinion. The fastening demanded by the design was a knurled head, brass 4-40 machine screw that was specially made on an automatic screw machine. In addition the screw had to be turned in by hand. Cost piled upon cost.

Solution to the problem was a Truss Phillips thread cutting, chrome plated screw. The pinion still had to be drilled but not tapped. The new screw could be driven by air gun. And it was available from stock. The changeover cut costs for the company and did not impair the appearance of their product. Source — *Steel Co. of Canada Ltd.*

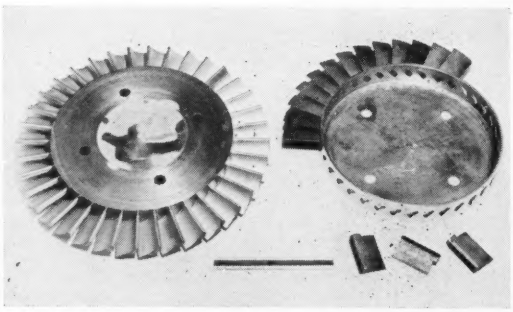
Circle 304 on Reader Service Card

Burn up costs in furnace

Production costs on a stainless steel turbine rotor assembly have been cut an incredible 80 percent by one manufacturer. The secret: redesign of the product to take advantage of a furnace brazing process.

The part was originally produced as a machined Type 347 stainless steel forging. This method was costly, especially since extensive and careful machining was required to produce the precisely contoured blade segments. Machining from the solid, however, was considered the only process that could meet the critical dimensional requirements of the rotor.

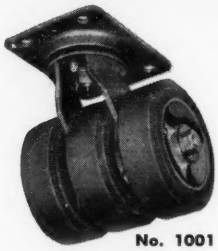
Redesign of the rotor called for a brazed assembly of Type 347 stainless steel details. The rotor hub is produced by brazing together a pre-machined stainless steel ring and disc. The ring is provided with airfoil-shaped slots to accept the blade root forgings. The forged blades are finish machined to specifications prior to brazing. Brazing, using Nicrobraz alloy, is conducted in a pure dry hydrogen furnace at 2,150 F. Proper control of the brazing cycle prevents distortion and holds critical dimensions well within the tolerance limits



of the turbine rotor's application. The redesign is made up of 39 separate pieces. Scrap costs have been reduced since improper machining requires only one piece to be scrapped rather than the entire rotor forging as previously. Source — *Wall-Colmonoy (Canada) Ltd.*

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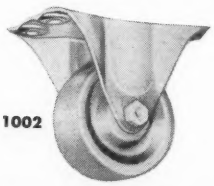
product news from — United Steel
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No. 1001

Tri-wheel caster for great capacity, with low overall height requirements

This Albion Tri-Wheel Caster is designed for heavy load-carrying where low overall height is also desired. Most of the standard models can be furnished this way in wheel diameters from 3¼″ to 18″.



No. 1002

Quiet-running caster for light duty applications

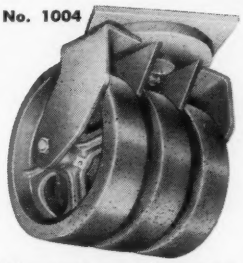
This light-weight, pressed steel caster is designed to provide smooth, quiet mobility in light duty applications, without harming floors. Available in swivel or rigid models, with Semi-steel, Rolite or Noflex (hard rubber centres with soft rubber treads) wheels.



No. 1003

Caster for pipe leg units

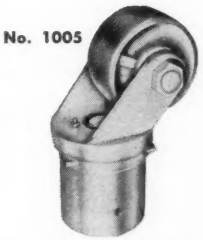
Albion pipe base casters are ideal for portable scaffolding, clothing racks, portable conveyors and other units with pipe legs. Unit shown here is equipped with thumb screw swivel lock and "T" handle wheel brake. Available in wheel sizes from 3¼″ to 8″.



No. 1004

7,700 pound capacity caster

Fitted with three 16″ x 5″ Moldon wheels, this Albion giant is rated at 7,700 pounds, yet overall height is only 19″. An 18″ wheel would give the same caster a rated capacity of 8,400 pounds with an overall height of only 21″. Special Albion casters have been supplied to handle loads as great as 30,000 pounds per caster.

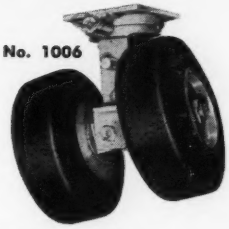


No. 1005

Inverted caster for handling heavy steel plate

A "field" is made by mounting a group of these units on steel posts so that heavy steel plate can be manoeuvred into position on them for shearing, punching, etc. Unit shown has a tubular attaching terminal and a completely sealed anti-friction bearing. Completely sealed against intrusion of dirt, scale or moisture.

In addition to a wide variety of "special" casters, some of which are shown here, United Steel Corporation also offers a complete range of standard Albion Industrial casters *from stock*. For full details on the casters shown (or any others) send the coupon or write outlining your requirements.



No. 1006

Caster follows floor irregularities

This unusual caster has an oscillating or "knee-action" feature which makes it ideal for use where loads must be kept level when moving over minor obstructions or depressions. Unit shown is equipped with press-on tires and a four-position swivel lock.



No. 1007

Swivel lock is safety feature

Albion vertical swivel lock shown on this caster is a simple, easily used spring-loaded device which locks caster at *right angle* to normal movement — or in line for easier steering. This feature can be furnished on most Albion swivel model casters.

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Briefs

In the 1960's, consumers will demand (and willingly pay for) durable goods with such old-fashioned virtues as quality and serviceability, having been burned by meaningless chrome and frills — so says industrial designer Walter P. Margulies . . . **and talking** of quality, British manufacturers are getting tired of the constant consumer cry about "pre-war" quality, and are fighting back. The president of a hosiery manufacturers' association in Leicester said the other day, "We offer current, postwar quality at less cost than ever before," thus burying the myth that time and research have stood still . . .

Stainless steel in a full range of colors will soon be on its way to market, creating infinite possibilities for designers of consumer products . . . **which reminds** us that public preference for steel grilles and other luxury touches applies as much to compacts as it does to full-sized cars. Stripped Ford Falcons and Ramblers are outsold by de-luxe models four to one . . . (How about that, Mr. Margulies? . . .)

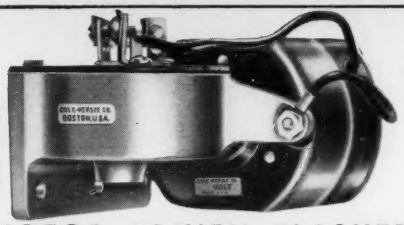
We like the story of the Toronto taxi fleet operator with a yen for engineering design. Seems he devised a plan to stop high-flagging, which is technical parlance for leaving the meter switched off and thus cheating the cabby's boss of the fare. Anyway, this incipient designer wired all the passenger seats in his cabs and tied the wiring to the meter. So now if the cabby fails to switch on the meter, the engine stalls. Drivers have been invited to beat the system for a $75 prize, without success. Our method would be to put the passenger on our lap and split the fare money with her . . .

This and that: Canadian scientists are peeling potatoes and apples without knives through a process of infrared heat treatment developed at the Department of Agriculture's plant this spring . . . **a new** line of theodolites has been engineered for North American practice after years of research . . . **Canadian** and U. S. producers of tellurium deny rumors of an impending shortage; estimate that annual production in the Western Hemisphere could be stepped up to 500,000 or 750,000 lb a year using only the present sources . . .

Someone once remarked that men must collect something, if only women; but collecting things is no longer our principal diversion. Canada's most

(Continued on page 80)

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People in the news

General manager of the company since 1950, **G. Crothers** assumes the additional responsibility of vice-president of General Controls Co. (Canada) Ltd.

★ ★ ★

A. Ray Dow, P.Eng., has been named general sales manager of British Oxygen Canada Ltd.

★ ★ ★



Crothers



Dow



Fenn



McCabe

Monsanto Canada Ltd. has elevated **Ray A. Fenn** to operating superintendent of the polystyrene department. A University of British Columbia graduate in mechanical engineering, he joined Monsanto in 1947 and served first as project engineer in Vancouver and until recently as industrial engineer in Montreal in charge of cost reduction programs, training and systems studies. Another Monsanto appointment is of **J. Kevin McCabe** as associate product sales manager, plastics. He joined the company in 1953 as a chemical sales representative after graduating from Loyola College with a B.Sc. degree in chemistry.

★ ★ ★

Philips Electronics Industries Ltd. has appointed **Roy L. Adams,** P.Eng., as head of the projects section of the professional equipment division's engineering department. The projects section translates customer requirements into technical proposals and specifications. Mr. Adams, an electrical engineering graduate of the University of Toronto, has a background of research, development and production experience with government and industry.



Tiller



Bush



Robertson



Reed

★ ★ ★

The Leland electric motor division of AMF Canada Ltd. has been acquired by Leland Electric Co. Ltd., a company recently formed by a group of Canadian investors. **G. Ernest Robertson,** formerly president of the division, is chairman of the board and chief executive officer of the new company. **Frank S. Bush,** formerly executive vice-president, is president and general manager. **Gordon D. Tiller,** formerly vice-president and general manager of Federal Wire & Cable Co. Ltd., joins the new company as vice-president, secretary and treasurer.

★ ★ ★

AMF Canada Ltd. has named **J. H. Reed** as general manager of the DeWalt division. He has been associated with American Machine & Foundry Co. in Canada for 17 years.

★ ★ ★

J. R. White, B.A.Sc., P.Eng., president of Imperial Oil Ltd., has been designated a director of Standard Oil Company, New Jersey. He joined Imperial Oil in 1933 as a draftsman, became a director in 1945, and was named president in 1953 at the age of 44.

★ ★ ★

M. L. Peterson has been appointed service engineering manager for Burroughs Adding Machine Co. of Canada Ltd. He succeeds J. C. Chadwick, who has been named service manager of the Toronto office. Mr. Peterson returns to Toronto after nine years in Missouri as regional service manager.

★ ★ ★

Dr. Clifford B. Purves will receive the C.I.C. Medal during the Chemical Institute of Canada's conference and exhibition in Ottawa on June 13. He is E. B. Eddy Professor of Industrial and Cellulose Chemistry at McGill and head of wood chemistry at the Pulp and Paper Research Institute of Canada.

★ ★ ★

Russell E. Cramer, Jr., has been elected president and Clarence D. Murdock vice-president of the Radio Condenser Co. Ltd.

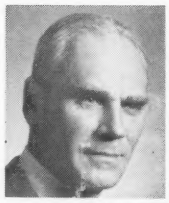
★ ★ ★

The board of directors of Dominion Engineering Works Ltd. have appointed **H. G. Welsford** as chairman of the board, **R. J. Barrett** as president, **A. H. Cowie,** P.Eng., as vice-president, and **G. D. Lewis** as executive vice-president, heavy machinery group.

★ ★ ★

A. Mark Bain, P.Eng., has been appointed assistant to the director of engineering, Dominion Bridge Co. Ltd. He was formerly chief engineer of the platework division at the Montreal branch, a position to which **David J. Lewis,** P.Eng., has been named.

★ ★ ★



Welsford



Bain



Lewis



Misener

The Ontario Research Foundation has appointed a new director, effective July 1. He is **Austin D. Misener,** Ph.D., F.Phys.S., F.R.S.C., P.Eng., M.E.I.C. Dr. Misener has headed the Department of Physics of the University of Western Ontario since 1949.

★ ★ ★

Ben H. Gelgoot, general sales manager of Acme Steel Co. of Canada Ltd., has been elevated to vice-president, marketing. He and Michael Burtyk, vice-president, production, have been elected to the board of directors.

★ ★ ★

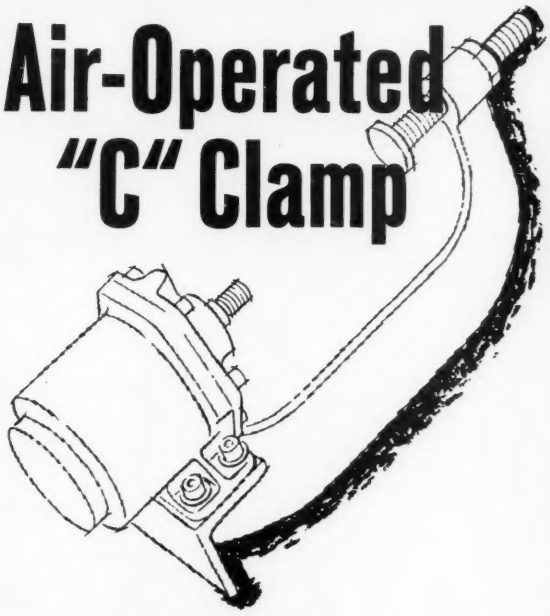
Ralph S. Robinson has been named technical director of Reichhold Chemicals (Canada) Ltd. and a subsidiary company, Varcum Chemical Corp. (Canada) Ltd. He was former-

(Continued on page 80)

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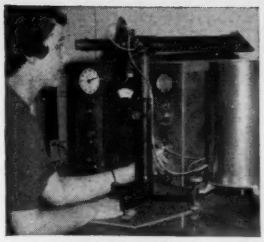
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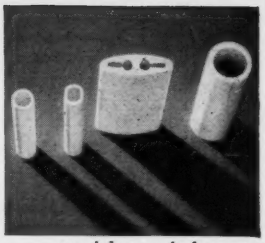
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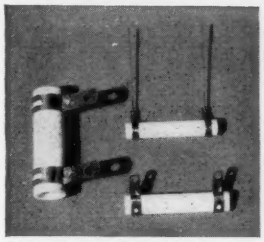
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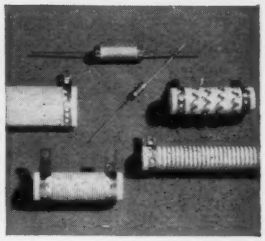
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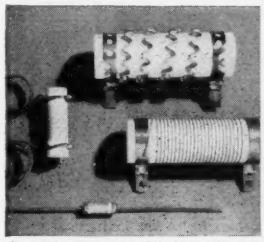
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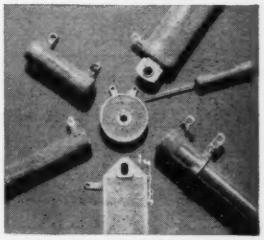
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Briefs — *continued*

popular recreation right now is bowling, which has over two million adherents. What's this got to do with design engineering? Only that one of the biggest single factors contributing to the bowling boom has been the invention of the automatic pinsetter . . .

Miscellaneous facts from many quarters: Australian industrialists are seeking licensing arrangements with more North American firms; point with pride to the fact that they have the most stable economic and political climate of any country on the under side of the globe . . . **average annual** output of the French chemical industry has increased 10% to 14% for the past decade, compared to 4% to 6% in the U. S. . . . **world's largest** dip tank has been installed in Chester, Penna.; it's used for polyvinyl chloride coating and can handle pieces up to 6½ ft wide and 20 ft long . . .

We hear that it will soon be possible for you to walk into a department store and buy a low-cost, do-it-yourself swimming pool — a real in-the-ground, properly engineered pool. All you need is the kit, instructions and the hole (plus the wherewithal). Engineering details: the sidewall consists of steel interlocking panels, light in weight and measuring only 30x40 in., which can be installed by two men . . .

Comparatively useless information: Oevrhead steel high-tension transmission towers were first used in 1903 (in Mexico) . . . **the Canadian** Research Development Foundation reports that a doctor from Ghana has developed a clamp for suturing arteries and veins (Oh, goodie) . . . **one of** Britain's most popular exports right now is gals. They're going to New York, where business executives, handicapped by a shortage of local products, are said to be outbidding each other for these cool English cucumbers. One theory is that the girls' accents lend chic to an office . . .

Talking of Britain, we were surprised to read somewhere that some of the big corporations there tower over their nearest (continental) European competitors. British Petroleum, for instance, chalks up annual sales of $1,700,000,000 compared with the $600,000,000 earnings of Europe's biggest, the Compagnie Francaise des Petroles; other comparisons, Imperial Chemical, $1,300,000,000 versus Germany's F. Bayer chemical group's $460,000,000; Unilever, $4,800,000,000, or four times better than Nestles; and British Motor Corporation, $740,000,000 as against Volkswagen's $650,000,000.

More miscellany: The largest closed circuit color TV picture ever projected, 18x24 ft, was produced in Philadelphia for the American Assembly of General Practice; more than 1,200 physicians saw the telecast of psychiatric techniques originating from the Philadelphia General Hospital . . . **37% of** the population of Canada now works compared with 40% in the U. S., 46% in the U. K. and 50% in West Germany . . . **the U. S.** Patent Office issues so many patents (1,000 a week) that it had to develop a quick and easy way to expedite searches; a system using electronic computer techniques is now being tested; if successful it will do in 30 minutes a job that formerly took a researcher a full day . . . **interesting example** of moonlighting involves an electronic data processing system out Pasadena (Calif.) way; by day it performs for Stanford University, which owns it, and at night it is used by the First National Bank of St. Jose, which has a long-term lease for eight hours every night . . .

Brief talepiece: Engineers report that London's Big Ben is developing a slight list. So now it has both the time and the inclination.

People in the news *continued*

ly head of research of Reichhold Chemicals in England.

★ ★ ★

Oxford University has awarded an honorary D.Sc. degree on **Dr. Gerhard Herzberg,** director of the National Research Council's division of pure physics, for his achievements in the field of molecular spectroscopy.

★ ★ ★

C. C. Thackray has been appointed chairman of the board and M. F. Anderson president of Dominion Rubber Co. Ltd.

★ ★ ★

Dr. D. W. R. McKinley, O.B.E., has been appointed associate director of the radio and electrical engineering division of the National Research Council.

★ ★ ★

Three years executive vice-president of International Nickel Co. of Canada, **J. Roy Gordon** has been elected president in succession to **Henry S. Wingate,** who becomes chairman of the board. Dr. John F. Thompson retired as chairman recently after serving Inco for 53 years, nine of them as chief officer.



Linden



Maguire



Love



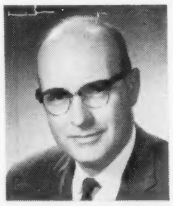
Campbell

★ ★ ★

Herbert A. Pakrul has been appointed vice-president and general manager of Atlas Titanium Ltd. He joined the parent company, Atlas Steels Ltd., in 1941 and was named manager of Atlas Titanium in 1958.

★ ★ ★

Appointments in the industrial products department of Canadian General Electric Co. Ltd. have been announced by the manager, distribution, instrument and specialty transformers as follows: **J. K. Linden,** P.Eng., responsible for their manufacture; **R. D. Maguire,** manager, engineering; **R. M. Love,** P.Eng., sales manager; **G. I. Campbell,** manager, product planning and marketing research; **R. F. Peacock,** P.Eng., superintendent, manufacturing, ballast; and **A. R. Goudge,** manager, ballast engineering; **A. H. Tutte,** manager, ballast sales and product engineering.

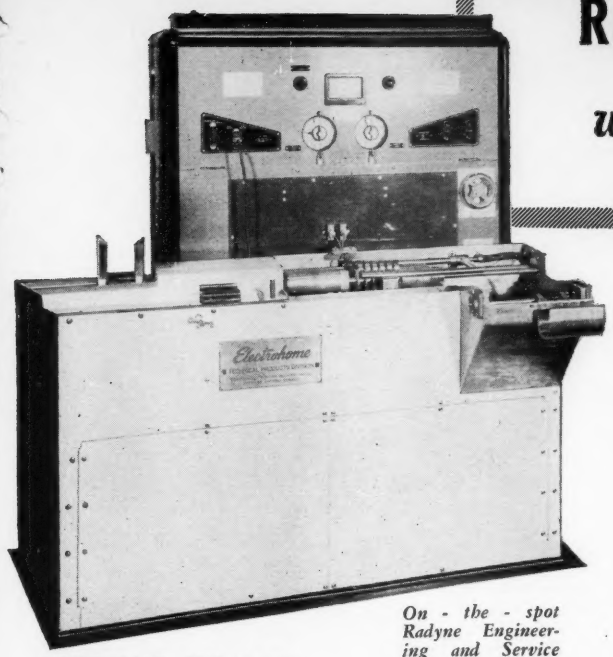


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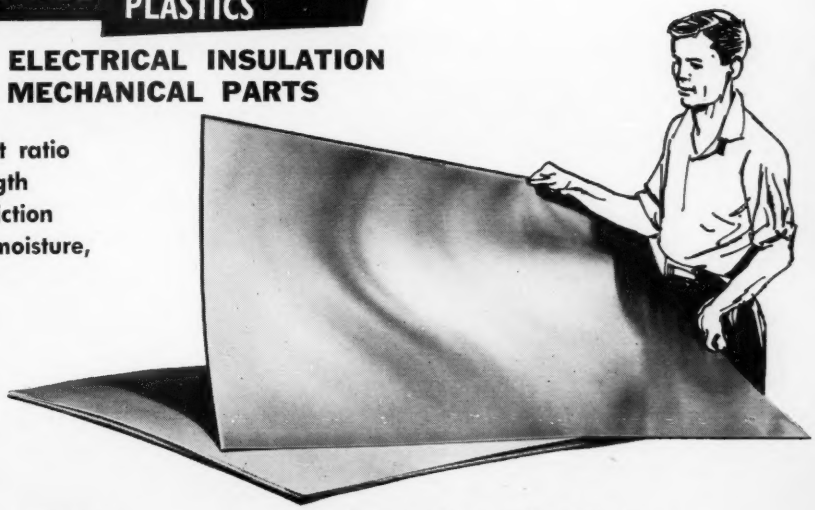
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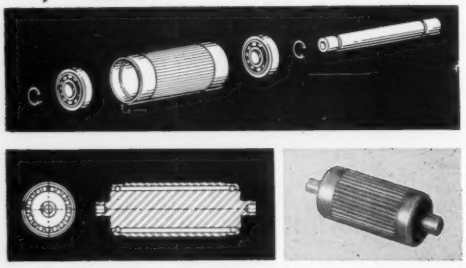


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Designers' book shelf

High productivity in Heavy Engineering, by A. G. Thompson, B.Sc., A.M.I.C.E., M.I.E.S., A.M.I.W. Publisher, Iliffe & Sons Ltd., London. 339 pages. Price $15.50.

This book is intended for everyone who is involved in the fabrication of metal by welding, including engineers, designers and management. As the author points out, welded fabrication techniques have revolutionized the production methods of many firms and indeed of complete industries. However, he has avoided repeating what has already been said at great length about welding, and instead deals with the technology which has been built up around welded fabrication — accurate dimensioning, coding, cutting machines, etc. Mr. Thompson, a well-known industrial consultant in the United Kingdom, devotes fully half the book to costing methods appropriate to heavy fabrication.

Circle 306 on Reader Service Card

Manufacturing Processes in Canada, by K. C. Livingston and T. C. Graham. Publisher—University of Toronto Press. 300 pages. Price $10.50.

A comprehensive volume by two University of Toronto graduates dealing with the manufacturing processes involved in the following Canadian industries: aluminum, beef, brewing, brick, detergents, glass, insulation, iron and steel, publishing, petroleum, pulp and paper, rubber, textiles, tobacco, and wire and cable.

All stages of processing are covered, from receiving of the raw materials to final packaging and shipping. Flow charts, diagrams, schematics, and sketches add to the value of the book. A handy reference for all engineers, and consulting designers especially.

Circle 307 on Reader Service Card

Other recent engineering publications: Zener Diode Handbook, by Staff of International Rectifier Corporation, El Segundo, Cal. 100 pages. Price $2.00.

Circle 308 on Reader Service Card

Concrete Formwork Designers Handbook, by H. R. Gill, 150 pages. Price $3.50. Publisher — Concrete Publications Limited, London, England.

Circle 309 on Reader Service Card

Automating the Manufacturing Process, by G. F. Hawley. 150 pages. Publisher — Reinhold Publishing Corporation. Price $4.95.

Circle 310 on Reader Service Card

Keeping informed

Silicones—Compiled specially for design engineers in the electronics industry, a 12-page illustrated booklet containing data on various products with direct applications in this field. Dow Corning Silicones Ltd.

Circle 311 on Reader Service Card

Sealing compounds—24-page handbook on Viton O-Rings, with test information on fluids and gases to which these compounds are compatible. Handbook is a supplement to an earlier manual on the same subject. Parker Seal Co.

Circle 312 on Reader Service Card

Conveyor bands—Technical information on flexible, rubber-covered steel bands, including data on vulcanizing and splicing ends and weight calculations for installations. Typical installations are illustrated in this 16-page booklet. Sandvik Canadian Ltd.

Circle 313 on Reader Service Card

Air compressors—Bulletin on a complete line of balanced/opposed compressors in sizes from 75 to 2,000 bhp and strokes ranging from 6 to 17 in. Clark Bros. Co.

Circle 314 on Reader Service Card

Instrument bearings—A new series of thin-width bearings, designed for use in synchros, gear trains, potentiometers, servos and small motors, is described in a technical bulletin. Actual sizes are shown. Lyman Tube & Bearings Ltd.

Circle 315 on Reader Service Card

Self-sticking identification—Catalogue describing products for marking piping systems, hazardous areas and equipment, wiring equipment, etc. The system conforms to all regular standards and specifications. W. H. Brady Co. of Canada Ltd.

Circle 316 on Reader Service Card

Electronic components—Said to be the largest catalogue on this subject is a 452-page buying guide of Essco tubes, transistors, capacitors, resistors, tools, technical books, etc. Electro Sonic Supply Co. Ltd.

Circle 317 on Reader Service Card

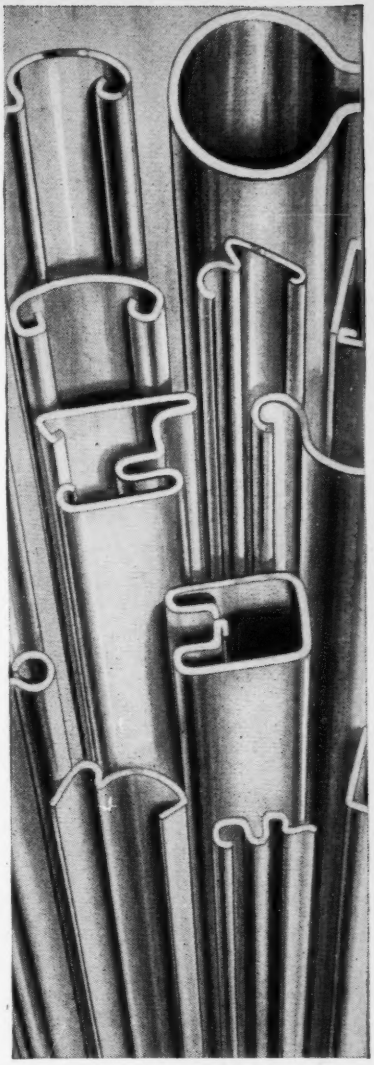
Generator sets—Brochure giving specifications on diesel-powered standby generator sets. General Motors Diesel Ltd.

Circle 318 on Reader Service Card

Gauges—A new line of miniature vertical-type gauges for draft, pressure, temperature, etc., is described in a 12-page bulletin. Rockwell Manufacturing Co. of Canada Ltd.

Circle 319 on Reader Service Card

(Continued on page 84)



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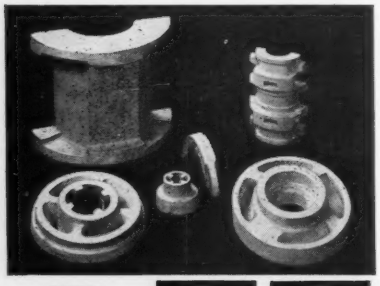
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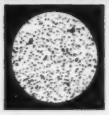


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Keeping informed *Continued*

Power supplies—32-page handbook describing a full range of direct-current power products, frequency changers, inverters and converters, etc. Also includes extensive technical data on the selection and application of these products. Bayly Engineering Ltd.

Circle 320 on Reader Service Card

Integrated transportation—Booklet describing "containerization" transport, meaning a system in which a single freight container operates interchangeably between rail, road and ship, thus cutting handling costs to the irreducible minimum. Fruehauf Trailer Co. of Canada Ltd.

Circle 321 on Reader Service Card

Fibre and plastics—Bulletin outlining the facilities for production of laminated plastic and vulcanized fibre, as well as for fabricating these materials into finished parts. Taylor Fibre Co.

Circle 322 on Reader Service Card

Drafting aids—Bulletin listing pre-cut shapes and sizes of pressure sensitive aids for paste-up layouts. By-Buk Co.

Circle 323 on Reader Service Card

Conduits—8-page bulletin on G-E conduit products, including plastic-jacketed conduit for areas of extreme corrosion and a new liquid plastic tape. Canadian General Electric Co. Ltd.

Circle 324 on Reader Service Card

Tubing products—Fast easy selection of tubing for any given application is offered in a 12-page selection and application guide. The bulletin briefly summarizes the significant properties of 84 tubing analyses in seven groups and describes 13 specialty tubing products. Superior Tube Co.

Circle 325 on Reader Service Card

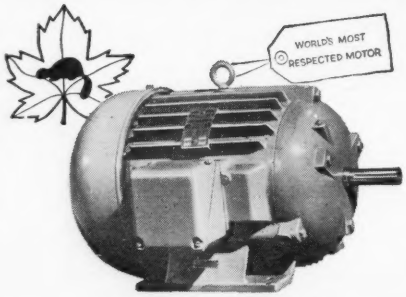
Ball bearings—A new type of radial bearing with load capacities 19 to 55% greater than equivalent size is described in an 8-page bulletin which also provides complete engineering information on the series. Split Ball-bearings.

Circle 326 on Reader Service Card

Flexible hoses—Technical information bulletin on hoses for air and materials handling, dust collection and fume control. Covers friction loss data, pressure ratings and other matters to help engineers with problems of selection, performance and installation. The Flexhaust Co.

Circle 327 on Reader Service Card

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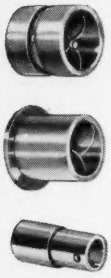
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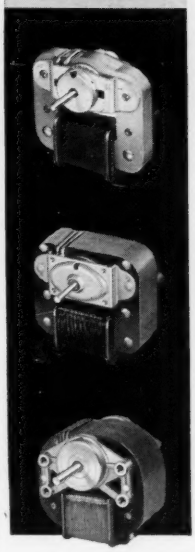
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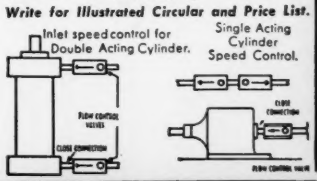
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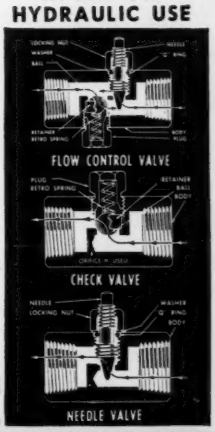


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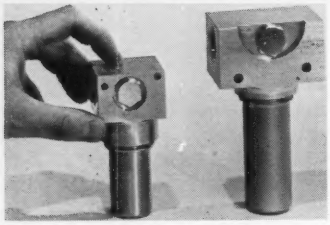


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For further information mark No. 103 on Readers' Service Card

New products and materials

Hydraulic filters



Light weight and compact design are features of two new high pressure airborne hydraulic filters, rated at 3.5 gpm and 10 gpm, now available from **Aviation Electric Ltd.**

These assemblies contain filter elements made from special pleated, resin-impregnated cellulose fibre sheet. Rated operating pressure for both is 3000 psi with a rated impulse burst pressure of 7500 psi. They can also be used for filtering aviation gasoline, kerosene, acetone, gaseous nitrogen and other related fluids.

Circle 329 on Reader Service Card

Voltage-digital converters

The new Epsco Inc. high-speed data link converter system can now be obtained through **Computing Devices of Canada Ltd.**

The basic element consists of two solid-state analog-digital converters designed for 9-bit straight binary digital encoding and decoding. The converter unit at the transmitter translates with +0.05% absolute accuracy, and the transmitted digital signals are unaffected by noise or other accuracy-limiting factors.

Circle 330 on Reader Service Card

Photo-electrical controls

Standard Instrument Corporation is manufacturing photo-electric controls designed for automatic industrial inspection. Among the operations performed by Robot-Eye are production counting, sorting, inspecting, traffic control, machine and operator safeguard, liquid level and bin level control, etc. Operating range of the standard units is up to 20 feet.

Circle 331 on Reader Service Card

Pump for viscous liquids

An electrical, fully submersible 4-inch pump for handling sludge and slurries, viscous liquids and muddy water containing solids has been introduced into Canada by the **Stenberg Corp. of Canada Ltd.**

Known as the Flyght CS-100, this pump has been successfully used by sewage authorities and contractors for pumping water and solids of toothpaste consistency. It can also be used in various applications in the process industries, including oil and sugar refineries, and by manufacturers of wood pulp, paint and cement.

Circle 332 on Reader Service Card

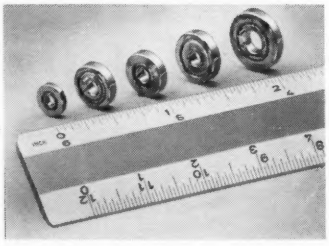
Pipe insulation

A lightweight, rigid, urethane-foam pipe insulation specially designed for use at temperatures ranging from −300°F. to +220°F. has been announced by Union Asbestos.

Tests show that the product, Unarco U-200, has a K factor of only 0.14 @ 70°F., the lowest known for a commercially available product of this type. U-200 is not affected by most mastics and sealers normally used for cold insulation. The material is self-extinguishing and has no capillarity.

Circle 333 on Reader Service Card

Thin-width bearings

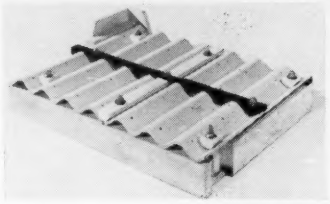


A new series of thin-width precision instrument bearings designed for use in synchros, gear trains, potentiometers, servos and small motors is now available from **Lyman Tube & Bearings Ltd.**

Featuring a high outside diameter/width ratio, these new MPB bearings allow designers to use economical through-bored and through-ground housings; resulting in more efficient production and improved bearing alignment. They are available in nine sizes from .2750 to .5000 inches and bores from .0937 to .1875 inches. Standard material for balls and rings is 440C stainless steel.

Circle 334 on Reader Service Card

Sand filter underdrain



A patented non-corrosive underdrain design for rapid sand filters has been developed by **Graver Water Conditioning Co.** The underdrain, known as Corru-Drain, is made of corrugated asbestos-cement sheets with the corrugation forming the laterals, and is designed for large flow rectangular or square concrete gravity filters.

Major advantage of the new design is simplicity of installation. A field test showed that 72 man-hours were required to install a 342 sq. ft. Corru-Drain unit, whereas installation time for an identical filter of another design was 168 hours. Corru-Drain requires no leveling, reinforcing rods, pre-setting of anchor bolts, extensive form work or concrete piers.

Circle 335 on Reader Service Card

Single flapper valve

Economy and light weight are the twin benefits offered by the Barber-Colman single flapper check valve, made by the **Barber-Colman Co.** Typical uses are to check air conditioning system ram air and air in compartment cooling systems and cabin pressurization systems.

The single flapper is hinged to permit air flow in one direction, and seals the valve opening upon air flow reversal. Internal leakage is low—less than 0.04 lb/min for most sizes. The series is available in several sizes to meet most applications.

Circle 336 on Reader Service Card

Camera-projector

A combination camera-projector for both 105 and 35 mm. film is offered by **Micro-Master, Keuffel & Esser Co.** The unit serves the dual purpose of yielding negatives and enlargements from the largest engineering drawings as well as small negatives for record copies.

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(Continued on page 85)

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New products and materials *continued*

Piston rings

Filled Teflon piston rings offering all the chemical and mechanical advantages of this versatile fluorocarbon resin are being marketed by **The Garlock Packing Co.** The rings are ideal for non-lubricated service to seal reciprocating, oscillating and rotary motion of both external and internal cylindrical surfaces against the leakage of liquids or gases. They are made from specially processed carbon-filled Teflon which exhibits a lower coefficient of friction than any other solid material.

Circle 338 on Reader Service Card

Duplicating machine



The new Ditto Masterfax machine was recently unveiled by **Ditto of Canada Ltd.** It makes direct process masters, it makes facsimile copies and it laminates.

The direct process master can be made not only from copy prepared on Masterfax paper, but also from newspaper clippings, letters and other material. The facsimile copy process is completely dry and eliminates chemicals and toxic mixture; it can make copies on any weight or grade of paper and is claimed to be the most economical copying process on the market. The machine's third function, laminating, covers documents and other important papers with a tough, protective plastic coating, and requires no complicated adjustments to do this.

Circle 339 on Reader Service Card

D.C. breakdown tester

Latest in its line of high voltage dielectric strength test sets, the **Canadian Research Institute** has just announced the new model DV-12V direct current breakdown tester, designed and made in Canada.

This instrument makes available a metered voltage of from 0 to 12 kilovolts filtered D.C. at a current capacity of up to 5 millamperes. Any of the standard Canadian Research Institute plug-in sensors may be used with the tester to give a wide variety of sensitivities of fault indication from the microampere region up. Originally designed as a D.C. spark tester for the continuous inspection of plastic covered wire, this test set finds wide use in chemical and electrical laboratories as a variable D.C. power supply and adjustable sensitivity breakdown tester.

Circle 340 on Reader Service Card

Pillow block bearings

Noise and vibration suppression are the applications for a new line of completely cushioned pillow block bearings introduced by **Triangle Manufacturing Co.**

The new series is self-aligning and has a very large oil reservoir to ensure long life. It is said to furnish more effective isolation from vibration than rubber grommets used at the mounting holes, though it is competitive in price. The DuPont Neoprene cushion completely encircles the bearing ball unit, insulating it from the mounting.

Circle 341 on Reader Service Card

Calibrator

Canadian Fairbanks-Morse Co. Ltd. is exclusively handling Canadian sales of a new torque-wrench calibrator designed for rapid loading and reading out of the "break-away" value of torque wrenches of any design.

The calibrator uses a conventional proving ring as a load measuring standard and operation is automatic for most torque-wrench designs. The wrench is inserted in the mechanism, and load links and range are set. At the break-away point of the wrench, the counter displays the torque value in either inch-pounds or foot-pounds. An adjustable thrust arm can be positioned for any usual length of torque wrench and four interchangeable socket inserts accommodate standard wrench tangs.

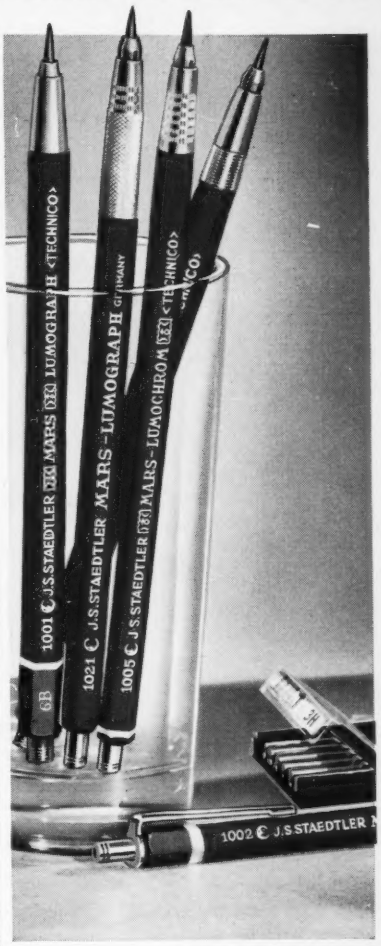
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(Continued on page 90)

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New products and materials *continued*

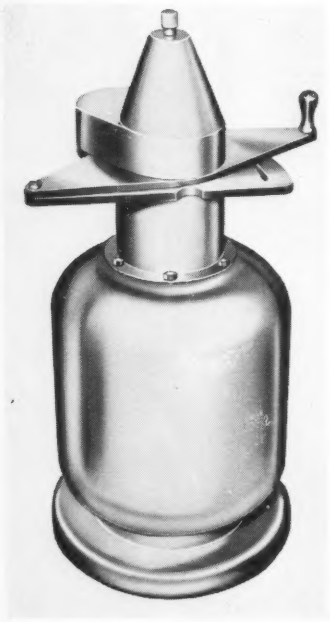
Servomechanisms

The Bristol Co. of Canada Ltd. is now offering two new rack-mounting Dynamaster servomechanisms. The new models are mounted in hinged swinging panels to fit standard 19-inch Retma relay racks, and both are suitable for applications in computing systems and all types of control systems.

Model 692 is mounted in a 19-inch panel 7 inches high, and can be mounted in a higher panel to accommodate encoders or additional retransmitting slide-wires. Model 694 uses a standard 11-inch Dynamaster scale and is mounted in a 19-inch rack panel 8¾ inches high; it is of particular advantage when the observer wishes to see the entire range scale.

Circle 343 on Reader Service Card

Gamma irradiator



Radionics Ltd. is offering a compact and highly versatile new gamma irradiator, the Victoreen model 870 CeCell, which provides average radiation intensity throughout its chamber of 50,000 r/hr from its cesium 137 source.

The CeCell makes it possible to apply gamma irradiation in routine laboratory, research or teaching fields as readily and safely as heat and vacuum are now applied. It is particularly suited to applications in chemistry, petroleum and refining, and in biology. The irradiator is 29 x 16 x 45 inches high and weighs about 700 pounds. The radioactive C's 137 is contained in a stainless steel capsule.

Circle 344 on Reader Service Card

Two-circuit switches

A new series of two-circuit precision switches designed for use on machine tool limit and control mechanisms has been introduced by Micro Switch, a division of **Honeywell Controls Ltd.**

The switches have a median mechanical life which exceeds 10 million operations at full overtravel. Three of the snap-action switches (designated the 3NN series) have a combined stacking width of only 2.03 inches. The step-design, arc-resistant plastic case provides extra space between the integral terminals, a feature that reduces the possibility of shorting. One of the mounting holes is elongated to eliminate the need for close tolerance in the centre-to-centre distance between mounting holes on the equipment.

Circle 345 on Reader Service Card

Governor

A new wrinkle in domestic automatic washers and washer-dryer combinations is a speed-detecting device which reduces vibration due to imbalance of the clothes load, reduces moisture content of clothes after spin-dry sequence and also reduces the normal matting tendency of clothes, especially the wrinkle-free fabrics. The device, a Synpro-Tex governor, is one of a family of speed detecting switches manufactured by **Torq Engineered Products Inc.**

The governor is attached to a drive shaft of the appliance in a time delay circuit. When the centrifugal force exerted on the clothes exceeds 1G, the governor switch cuts out the appliance motor, and this causes the machine to coast and consequently allows the clothes to fall away from the sides of the machine and become re-distributed. When the centrifugal force reduces to less than 1G, the governor cuts in the motor to resume the sequence. The governor cycles in this manner approximately 20 times,



"Frampton . . . you're beginning to develop an cttitude of complacency."

and by then the clothes are usually dry, distributed in near-perfect balance and "fluffy".

Circle 346 on Reader Service Card

Lubricant

To demonstrate its many applications, **Dow Corning Silicones Ltd.** are offering free samples of a lubricant called Molykote G.

This molybdenum disulphide lubricant has already proved to have wide general industrial applications, including those where standard lubricants either failed entirely or displayed only limited lubricating value. It will eliminate metal fretting, galling, seizing and pickup in high bearing pressure applications such as heavily loaded gears, cold metal forming, threaded connections and press fitting. When applied to new machinery, it is especially effective as a "wear in" lubricant which not only shortens run-in time but also reduces initial wear to such a degree that treated machines are capable of a much higher degree of precision.

Circle 347 on Reader Service Card

New wire joiner

A resistance butt welder to produce continuous wire feeding has been developed by the **Lincoln Electric Co. of Canada Ltd.** The wire joiner eliminates time delay from reel changing and wire threading in submerged arc welding as well as in other types of industrial operations using wire fed from a coil.

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Jack Cox *

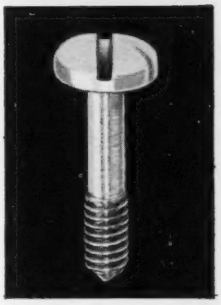


helped a user save more than 65% on special screws

A user of the special stainless steel screw (upper right) paid the price of manufacture on automatic screw machines, until Jack Cox showed how Stelco cold heading could produce an entirely satisfactory screw with a saving of more than 65%. The Stelco product is shown lower right.

Contact any Stelco Sales Office for advice or information and write for the bulletin "Bits and Pieces" for regular news of fastener developments.





* Mr. J. H. Cox, a Stelco representative in the Toronto area, makes fasteners his business. He can bring personal interest and expert attention to your special fastener needs.

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Editorial

Good engineers do not always make good managers

. . . it takes more than slide rule skill

There is a strong disposition in some circles to be scornful of the qualifications and attributes necessary to management.

It is sometimes said that any one of a hundred engineers of average intelligence could do a good job of managing a going concern or a new business, regardless of age, experience, background or individual abilities.

Some engineers are so sure of this that they attempt to prove it by going into business for themselves. These would-be managers deserve full marks for initiative; unfortunately initiative is not enough, as witness the lists of business failures. These reveal that at least 80% of all such failures in any year are due to lack of managerial experience or managerial incompetence.

DE carried a challenge to all would-be managers in the April issue to give themselves a ten-point check. We trust that you took advantage of that opportunity to assess your potential.

It is the job of the manager to organize and marshal the manpower and resources at his disposal with maximum efficiency to achieve the desired result.

This involves the assumption of heavy responsibilities, not the least of which is the making of major decisions. Any one of these, if wrong, might have unpleasant — and even disastrous — consequences.

There have been a great many companies which have gone steadily downhill and declined when they ought to have flourished and expanded, for no other reason than bad management. Thus for many of us, the difference between good and bad management could be the difference between keeping a job or losing it.

Leadership, drive, tact, personality, perception—all these are desirable, even essential, qualities in a manager. He must also be able to delegate responsibility to those in whom he has confidence, and he must be free to do those things he feels must be done in the interests of company well-being and growth. One manager we talked to in the past month said this was his biggest complaint: every move he attempted was blocked by those on the board; his business life was one frustration after another.

Others associated with the company owe management their loyalty, trust and respect. A management will not long enjoy these if it fails to earn them.

The success, or failure, then, of any concern, depends more on the calibre of those charged with the responsibility for its management than on any other single thing.

And the responsibilities of management, even while they carry with them privilege and higher-than-average rewards, sometimes impose an all but intolerable strain. Perhaps that explains why they are neither sought nor desired by all men, whether they be engineers or not.

Doug Kaill



"Dad, it was bigger than big!"

Which raises the question: "How big *is* big?" Depends on your point of view . . . and your need. But no matter what size machine you require—whether it's big, not so big, or huge—we can build it . . . and build it well. Here's why:

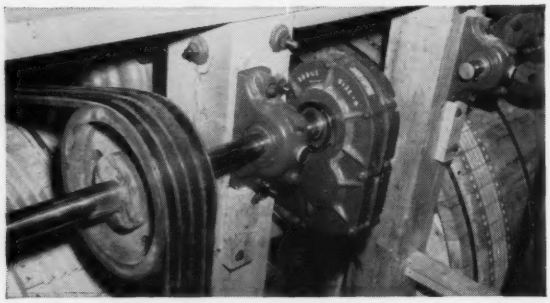
● The latest, most efficient machinery-building equipment in two modern plants. (Trois Rivieres and Toronto) ● Sound engineering experience from a staff of knowledgeable technicians backed up by constant research and development ● Workmanship at shop level of the highest quality from a production staff with generations of experience . . . they do everything the way it should be done ● A flawless record of "Big" achievements for a diverse list of North American manufacturers.

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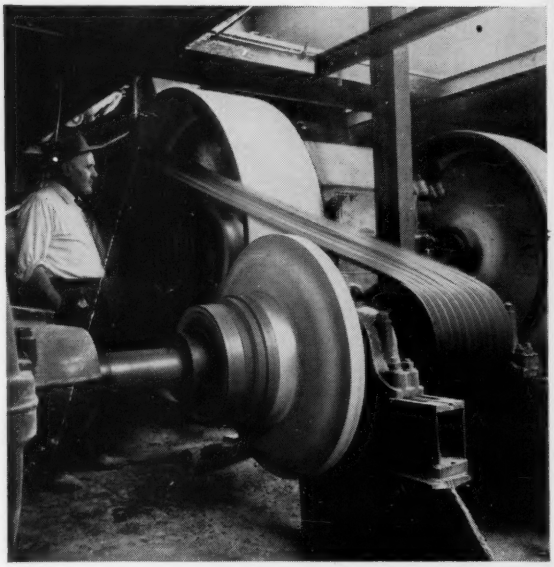
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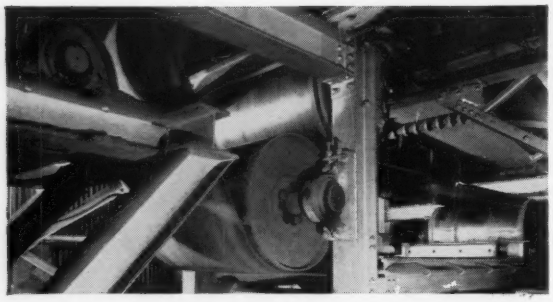
How Dodge pillow blocks with Timken bearings give longer life with less maintenance



1. Two 2⅞" Dodge Special Duty pillow blocks equipped with Timken tapered roller bearings, support the line shaft driving six by eight foot tanning drums. The tapered design of Timken bearings enables them to take both radial and thrust loads in any combination.



2. The crusher at a trap rock and asphalt plant runs faster, gives more production now that Dodge Double Interlock pillow blocks on Timken bearings are installed. The Timken bearings in these blocks give full-line contact between rollers and races for greater load carrying capacity.

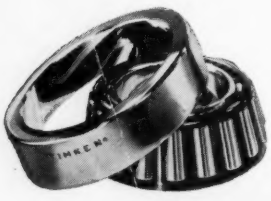


3. The Timken bearings in All-Steel Dodge pillow blocks must stand up under adverse operating conditions found when sintering metals. One major advantage of Timken tapered roller bearings is their ability to hold housings and shafts concentric, thus keeping lubricant in, dirt and dust out.

The photo at right shows the Dodge All-Steel pillow block Timken bearing equipped. The specially designed bearing has a tapered bore with self-aligning spherical outer surface—never needs adjustment.

There's a Dodge pillow block equipped with Timken bearings to fill every engineering need: All-Steel, Type "E", Double-Interlock, Type "C" and Special Duty. And with Timken bearings, space consuming thrust devices are not needed. Look for Timken bearings in all the machines you buy or build. They're the symbol of quality. Canadian Timken, St. Thomas, Ontario, Canada. A division of The Timken Roller Bearing Company. Timken bearings manufactured in Canada, Australia, England, France and U.S.A.





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